II-B.Tech–I SEM

STUDENT HANDBOOK

A.Y.2018-19

HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE

(Accredited by NAAC-A, Approved by A.I.C.T.E., New Delhi, Affiliated to JNTU Hyderabad)

Bogaram(V),Keesara(M),Medchal(Dist),Hyderabad-501301

Dept. of Electrical &Electronics Engineering

www.hits.ac.in

VISION STATEMENT

VISION STATEMENT OF HITS

To be a premier institute for the study of engineering, technology and management by maintaining high academic standards which promote the analytical thinking and independent judgment among the prime stakeholders enabling them to function responsibly in the globalized society

MISSION STATEMENT

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M1	To impart quality professional education that meets the needs of present and emerging technological world.
M2	To strive for student achievement and success, preparing them for life and leadership with ethics.
M3	To provide a scholarly and vibrant learning environment that enables faculty, staff and students achieve personal and professional growth.
M4	To contribute to advancement of knowledge, in both fundamental and applied areas of engineering, technology & management.
M5	To undertake research and development works by forging alliances with research institutes, government organizations, industries and alumni and become a center of excellence for quality professional educations and research.

GOALS OF HITS

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Goals of Engineering education at undergraduate / graduate level:

- Equip students with industry – accepted career and life skills
- To create a knowledge warehouse for students
- To disseminate information on skills and competencies that are in use and in demand by the industry
- To create learning environment where the campus culture acts as a catalyst to student fraternity to understand their core competencies, enhance their competencies and improve their career prospects.
- To provide base for lifelong learning and professional development in support of evolving career objectives, which include being informed, effective, and responsible participants within the engineering profession and in society.
- To prepare students for graduate study in Engineering and Technology.
- To prepare graduates to engineering practice by learning from professional engineering assignments.

Our Pioneers...

Welcome to the VPR's Family. We are delighted to know that you are keen to seek admission In our reputed institutions, offering Engineering, Pharmacy & Management courses in both under graduation & post graduation in Telangana & A.P. Our institutions have today emerged as one of the reputed group of institutions and very well known for the technical training in our Country. The academic ambience in the institute is so conducive for everyone that they bring out their best. This has helped our students to mould their personality; improve their performance and this has led our alumni reach very senior levels in reputed companies all over the world. We welcome you to be a part of our growing and glorious family. Our best wishes for your resounding success in the future endeavours and we eagerly look forward to see you at our campus' in this academic year.

Dr. A. Vara Prasada Reddy

CHAIRMAN

Holy Mary & Nalanda Group of Institutions offering Engineering, Pharmacy & Management courses in both under graduation & post graduation in Telangana & A.P. Our faculty continues to provide their expertise through the industry consulting services and continuing education programmes. The departments has also established rich and formal relationships with the industry through the courses and regular class room interactions, inviting industry professionals and through its cutting edge research programmes. The significant growth in the IT as well as Non - IT sectors can only be sustained by constant supply of high quality human resources. It is important that our students find Jobs to suit their aptitude and background. Such a matching of challenges in the job with the aptitude of students is increasingly important in the competitive world today, where innovation will be greatest key to growth. I sincerely hope that our students will use the facilities provided to them in our campus and find their profession and justify the trust placed in them by their family, Society and Nation in helping the Country in its march towards becoming adeveloped Country. Let me take this opportunity to congratulate all departments of our Holy Mary and Nalanda Group of Institutions for their untiring efforts and wish all the students the very best in their attempts to build up purposeful careers for them.

Dr. A. Vijaya Sarada Reddy,

SECRETARY

I am pleased to welcome you all to the implicit space of VPR's family in which you will find insight of various colleges, courses and plans to build a student - cantered professional educational services. At Holy Mary and Nalanda Group of Institutions we strive to nurture our students to become all rounder in their intellectual, professional, physical & moral developments which not only make them a good human being but also helps them to reach the heights in their career in present scenario of industry culture.

Sri. A. Siddharth Reddy

VICE CHAIRMAN

Holy Mary and Nalanda Group, right from its inception has been committed to deliver good quality education aimed at the all-round development of the student. In today's competitive scenario it is imperative that the educational institutions offering higher education have to ensure that the students get an extra edge in this regard. It is here that the institutes play a vital role. In this perspective VPR has taken care to offer the 'extra edge' through various initiatives aimed at **Yamini Reddy** going beyond the text books.

Smt. A. Yamini Reddy

JOINT SECRETARY

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EEE STUDENT HANDBOOK

II-B.Tech–I SEM

ACADEMIC YEAR : 2018-19

Document No: HITS/EEE/SHB/2018 Date of Issue: Aug'2018

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1. GENERAL INFORMATION

About the College

1.1 BEAUTIFUL CAMPUS:

Set in Sylvan surroundings away from the hustle & bustle of city life yet only 6 km away from Raheja IT Park on Hyderabad – Warangal national highway, the Institute is extremely conducive to academic, co-curricular and extra-curricular activities. It has large and well ventilated buildings with modern equipment in place and "State of the art", sports facilities.

HIGHLIGHTS:

1.2 FACULTY:

The College is proud to have the best faculty, a blend of experienced and academics with eminent academicians team IIT's, NIT's and other reputed organizations teaching at the Institute that makes HITS as one of the best Institute pursue B.Tech, M.Tech and MBA as one of the under JNTU Hyderabad. The faculty is constantly encouraged to upgrade their qualifications and a number of them have enrolled for Ph.D. Most of the faculty members have been empowered with Impact teachings under Wipro Mission 10X program.

1.3 INFRASTRUCTURES:

The Institute is housed in a RCC Building with a built up area of 2.50 Lakh Sq. Ft in 100 Acres and established an Air Conditioned Auditorium with Seminar Halls and a Central Library. A good canteen caters hygienic food and a fleet of buses running from all important points to bring the students to the college. Accessibility of Indi cash Bank ATM within the Campus is a recent addition to enable students and faculty to withdraw cash anytime.

1.4 LABORATORIES:

The Institute has State of the art laboratories with 500 plus Pentium IV Branded Systems equipped with latest hardware and software with online testing facility catering to the needs of CSE Program. The Institute also has well equipped Electronic Labs, Electrical Engineering Labs and Workshops for Mechanical and Civil Engineering Students. The college has recently established cadence lab for VLSI design, CATIA and Power Systems Lab.

1.5 TOEFL CENTRE:

The Institute is an Authorized TOEFL iBT Centre, which will conduct tests all through the year as per the iBT schedule.

1.6 ENGLISH LANGUAGE LABORATORY:

The Institute has established Ultramodern Computerized English language Laboratory with 60 plus Computer Systems loaded with latest Software to enhance the Soft skills of Students to make the Students Industry ready.

1.7 R&D CELL:

The Institute has an R&D Cell under the Chairmanship of Prof. Dr. P. Bhaskara Reddy. The R&D cell undertakes externally funded R&D projects from agencies like AICTE, DST, UGC and other similar state, private and society / trust bodies. It also undertakes research publications and interactions of faculty members with outside world.

1.8 LIBRARY:

The Institute Library has over 34598 books and 78 National and International journals that are required to all branches of Engineering. The Institute has the unique distinction of becoming Member of DELNET that connects more than 700 libraries in Asia Pacific Region. The Library has 25 Computers with Internet Facility that makes our knowledge Savvy Students to be technically competent on par with Industry professionals.

1.9 NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING (NPTEL)

The main objective of NPTEL program is to enhance the quality of engineering education in the country by developing curriculum based video and web courses. This is being carried out by seven IITs and IISc Bangalore as a collaborative project. In the first phase of the project, supplementary content for 129 web courses in engineering / science and humanities have been developed. Each course contains materials that can be covered in depth in 40 or more lecture hours. In addition, 110 courses have been developed in video format, with each course comprising of approximately 40 or more one-hour lectures. In the next phase other premier institutions are also likely to participate in content creation.

1.10 CO-CURRICULAR ACTIVITIES:

The Institution organizes Local Industrial Visits to Organizations like CPRI, HBL, POWEWR GRID SUBSTATIONS, GIS SUBSTATIONS, BHEL, and to Student Conferences like NCEEET Student Conference at INFOSYS, Gachibowli Campus, and Government Sponsored Summits like INDO SOFT IT Summit 2008 at Hitex City Convention Centre to Interface with the Industry for Career Planning and to make them Industry Ready. The Aeronautical Students Visited IIT Madras for Aeromodelling Workshop and Air Force Academy Dundigal for

Knowledge Enhancement. The Institute focuses on Techno Management Events like ELYSIUM to enhance the Technical Skills and Soft Skills to make them Employable.

1.11 PROFESSIONAL BODIES:

Holy Mary Institute of Technology and science has the unique distinction of becoming Institutional Member in Professional bodies such as Confederation of Indian Industry (CII), Aeronautical Society of India (AeSI), Computer Society of India (CSI), Institute of Electronics and Telecommunication Engineering (IETE), Indian Society of Technical Education (ISTE), ELIAP and Hyderabad Management Association.

1.12 EXTRA-CURRICULAR ACTIVITIES:

The Institute helps the B.Tech, M.Tech and MBA Students to imbibe Culture, Knowledge and Sportsman Spirit during their Study Period.

The Institution has a Basketball Court,Volley ball Court, Beach Volley ball Court, Cricket Stadium with 400 meter Excellent track for Athletic Meet and Indoor Stadium for Shuttle Badminton and Gymnasium. MLRIT has been regularly conducting JNTU Zonal Games Football, Cricket, and State level Volleyball Tournaments. The Institute has been awarded as the best organiser for conducting JNTU Zone A Intercollegiate Tournaments by JNTUH. MLRIT is affiliated to Hyderabad Cricket Association (HCA) to play league Cricket

Matches. The college has conducted 5K RUN in 2008-09 and south zone Cricket Tournament in 2009-10.

The Institute also organises events like Traditional Day, Annual Day, Fashion Shows, Rockshows and other Cultural Events. This year for the First time, it has conducted Danz Pavimento a State Level Dance Competition and a Musical Nite by International Repute *Vishal*

& *Shekhar* during Annual Day Celebrations. MLR Institutions has been conducting Traditional Day every year. The purpose of Celebrating traditional day is basically to imbibe a spirit of Oneness, where the First year Students who have joined the Institute shed their Inhibitions, play and dine together with their seniors and recollect the old traditions & glory of the Past. Apart from that the traditional day is being celebrated with a purpose of removing fear and as a measure of Anti-Ragging activity.

The college has a **National Service Scheme (NSS)** unit, which conducts a number of programmes viz blood donation camp, tree plantation, community services in the adjoining villages, flood relief, etc. The college has sent a team of volunteers for flood relief service on 14th Oct. 2009 to Mahaboob Nagar.

1.13 STUDENTS COUNSELING & CAREER SERVICES DEPT (SCCS-DEPT):

HITS is only institution among 600+ professional colleges in AP, that takes into consideration each student individual aspiration and ambition into audit, and extend support on exclusive

basis to each student for successful future into Employment / Entrepreneur / Research & Development / Higher Education before graduating from our campus.

1.14 FINISHING SCHOOL:

HITS Institute of Technology is the only Institute which offers Special Training programme partnering Institute for Electronic Governance, Govt of A.P and Infosys. The students from the Institute are selected every year and given special Training programme to make them Industry Grade and opportunity is given to them to place themselves in Multi National Companies.

1.15 IN HOUSE PROJECTS:

The students are taking part in International Project competitions hosted by major MNCs, like IBM, Microsoft and Infosys. The Great Mind Challenge hosted by IBM, Microsoft Imagine Cup and project work as part of foundation programme conducted under the aegis of Infosys are some of the important projects presently being undertaken by the students of HITS. Further, the students are encouraged to do In House Projects under the supervision of expect faculty members.

1.16 MOUs:

The Institute has MOUs for student and faculty enhancement programmes with Multi National Companies like

- **IBM**

  IBM has extablished **"**Center of Excellence**"** in HITS

- **Sun Microsystem Systems**

  Student Development Programmes and Certificates

- **Oracle**

  Faculty and Student Development Programmes

- **WIPRO: Mission – 10X Programme**

Faculty impact teaching programme

- **CA Labs**

Student and Faculty enablement Programme

- **Infotech**

To enhance the quality of educational experience for student community

- **Mahindra Satyam**

Industry Oriented course ware and Technology

- **Institute of Electronic Governance**

Faculty Enablement Programme on **"**Soft Skills, Technical Skills, Reasoning and Aptitude and Basic Computer Skills**"**.

- **Indo – US Collaboration for Engineering Education**

Faculty Development Programme sponsored by Infosys

- **Microsoft IT Academy**

Student and Faculty enablement programme

- **Infosys**

Foundation Programme for students

- **IIIT, Gachibowli, Hyderabad**

Certification in Information Technology (CIT) for students

- **SAM Technologies**

In house projects in Robotics and Embedded System

1.17 STUDENT ACHIEVEMENTS:

- *Ms. R. PALANIAMMAL* of Aeronautical Engineering department has secured a University Rank and Gold Medal for the batch 2005-2009.

- *A PRAVEEN KUMAR* secured 105th rank in GATE.

- Rishit D Shah became the Microsoft Student Partner and Microsoft Student Campus Ambassador. He is a Microsoft Certified Professional.

- N. Sai Praneeth also has been selected as a Microsoft student ambassador.

- M. Prashanth Reddy and M. Ramya of CSE Department have been selected as the Student Ambassador for IBM.

- The CSE department students Nikhil Bharadwaj, Shashank and Sulibhavi Santhosh developed a Google Application connecting all the institute activities. Lolitha and

  Gananasudha of IT, Praneeth, Rajender, Akshay Raj, Harish and Pankaj of CSE, Achuth and Gautam of Aero are maintaining the application.

- M Pavan Kumar of CSE Department has been selected as brand Ambassador of Sun Academic Initiative.

- 253 students and 5 faculty members have got IBM DB2 Certification as part of TGMC'09.

- The Institute has achieved 100% results in Aeronautical Engineering, 99% in CSE, 94% in ECE, 91% in MCA and 83% in MBA departments for outgoing batches.

- The Students of MLRIT have won Volleyball Tournament and were Runner's in Table Tennis Singles and Doubles JNTU Zone 'A' Inter Collegiate Tournament.

- P Shivaprasad of MBA has represented Senior National Basketball Tournament held at Delhi.

- G. Manikanta Gupta, ECE 1st Year won "National memory championship" in abstract images, organized by World Memory Council.

1.18 CONTACT INFORMATION

Principal	-	Prof. Dr. P. Bhaskara Reddy
	-	9866678599
Dean (CS)	-	Prof. K. L. Chugh
	-	9866666601
Department Head CSE	-	Mr.N.Chandra Sekhar Reddy
	-	9618880606
Department Head ECE	-	Dr. A.V.Paramkusam
	-	9160404638
Department Head IT	-	Dr. KVSN Rama rao
	-	7032902339
Department Head AERO	-	Dr.M..Satyanarayana Gupta
	-	9160404640
Department Head MECH	-	Dr.S.Madhu
	-	9160404635
Department Head MBA	-	Dr. S. Sunitha
	-	9160404639
Department Head H&S	-	Dr. V. Radhika Devi
	-	9160404636
Administrative Officer	-	Mr.G. Prabhakar Reddy
	-	9200176828

2. PLACEMENT & HIGHER STUDIES

MLR Institute of Technology has a unique distinction of placing their First Batch of B.Tech/MCA Students in their prefinal year of Study and MBA Students in Multi National Companies. The Institute has so far interacted with more than 96 Companies and 142 Selections from B.Tech/MCA and MBA Programmes have taken Place.

In this direction Apart from the Placements the Institute has arranged Summer Internship Programmes with Companies like M/s Infotech Enterprises Ltd, Mahindra Finance, Max New York Life Insurance, Nokia Ltd , Mahindra Finance, Bajaj Capital Ltd, Reliance Money and Tata AIG for Engineering and MBA Students to develop Mentor Relationships and to get to know about the Work Culture and gain Competencies to make them Industry Ready during their Study period.

The Institute has arranged Campus Recruitment drives with MNC's Like Tata Advanced Systems, IBM, Medha Servo drives, NR Radio & Switches Pvt. Ltd, OsiTechnologies Ltd, Genpact, Reliance Money, Nagarjuna Cements Ltd & Oasis Software Informatics.

The Institute organized an Industrial Tour to 3rd & 4th Year Aeronautical Engineering Students to Satish Dawan Space Center (SHAR) Sriharikota on 16-12-2009. The 4th year students visited Airforce Academy, Dundigal, for an Industrial Visit on 22-12-2009.

The CSE & ECE students visited Infosys Infosys on 18-07-2009 for the SPARK Programme which is an orientation programme on Information Technology Space.

2.1 INDUSTRY GRADE SKILLS REQUIRED FOR EMPLOYMENT

Behavioral and Communication Skills are recognized as important elements in professional development of an Engineer including English for specific purposes. Employers give considerable value to these diverse set of skills at the time of interviews.

In addition to course curriculum, every student will gain the following skills during the study period:

- Analytical and Problem solving skills
- Subject – specific knowledge
- Research and improved decision making abilities
- Oral communication skills
- Managerial skills

- Understanding of other cultures
- Confidence and competence to work in International environment

As students are the future leaders, the Responsibility, Accountability and exhibiting the leadership skills should start from the first year of engineering. Every student is advised to read / practice from the following books;

- Verbal and Nonverbal by RS Agarwal
- Baron GRE
- Wren and Martin English Grammer Book

2.2 IMPORTANT CRITERIA OF EMPLOYMENT

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In addition to the industry grade skills required for employment, the most important criteria for employment is that the student should get a minimum of 60% in academics with no backlogs to make them eligible for campus recruitments. In the recent past, many companies stipulated a cut of 65% for attending the interview / writing the test. Every student should Endeavour to achieve a minimum of 65% with no backlogs to make them suitable for picking up by good companies.

Job Portals:

1. www.freshersworld.com
2. www.monster.com
3. www.naukri.com

2.3 HIGHER STUDIES

M.Tech

The Graduate Aptitude Test in Engineering (GATE) is an all-India examination administered and conducted in eight zones across the country by the GATE Committee comprising faculty from Indian Institute of Science, Bangalore and seven Indian Institutes of Technology on behalf of the National Coordinating Board - GATE, Department of Education, Ministry of Human Resources Development (MHRD), and Government of India.

Objective

To identify meritorious and motivated candidates for admission to Post Graduate Programmes in

Engineering, Technology, Architecture and Pharmacy at the National level. To serve as benchmark for normalization of the Undergraduate Engineering Education in the country.

This provides an opportunity for advanced engineering education in India. An M.E or M.Tech degree is a desirable qualification for our young engineers seeking a rewarding professional career. Engineering students, while in the final year of their degree course, spend considerable time in seeking an opening for studies in foreign universities.

The students are advised to pursue M.Tech in IIT's/NIT's/University Colleges.

MBA

Earning a Master's of Business Administration (MBA) degree can provide you with management skills and business expertise that open new career opportunities to you. An MBA program will also launch you into the much higher pay range that upper level managers and executives enjoy. Furthermore, in the high-level positions, an MBA degree will allow you to hold and your work will often be more interesting and rewarding.

The students are advised to pursue M.BA in IIM's/XLRI/Reputed Business Schools.

Higher Studies Abroad

TOEFL is mandatory for seeking admission in any academic course at any level- undergraduate, graduate or post graduate, in USA and Canada. Similarly UK Universities ask for IELTS for seeking admission to graduate and past graduate courses.

GRE The Graduate Record Examination (GRE) is administered by the Educational Testing Services (ETS) for admission into all graduate academic programs (except management) in universities across USA and Canada and some selected universities across the world including India. The exam is a Computer Adaptive Test and is administered at any of the Sylvan testing centers in the country after prior registration.

The GMAT is a Computer Adaptive Test administered online by Educational Testing Services (ETS) through Sylvan testing centers located in all the major cities in India. Those who wish to enroll for courses in Business Management in American universities have to take the GMAT test and submit their scores to the department.

2.4 VARIOUS SCHOLARSHIPS AVAILABLE IN INDIA

Bharat Petroleum Scholarship For Higher Studies | Balarama Digest Scholarship | Central Institute of Indian Languages | Fair & Lovely Foundation - Project Saraswati Scholarships | Government Of India Office of the Director General of Civil Aviation Scholarship | Homi Bhabha Centre For Science Education Tata Institute of Fundamental Research Research Scholarships | HSBC Scholarships | Indian Council Of Agricultural Research Award Of National Talent Scholarship In Agriculture | Indian Institute Of Geomagnetism Research Scholars | Invention Awards For School Children | Indian Oil Corporation Ltd (IOCL) - Scholarships | Jawaharlal Nehru Memorial Fund Jawaharlal Nehru Scholarships For Doctoral Studies | Junior Research Scholarships For Cancer Biology Tata Memorial Centre & Tata Memorial Hospital | Jaigopal Garodia Vivekananda Trust Scholarships | Lalit Kala Akademi - Scholarship | Mahindra All India Talent Scholarships For Diploma courses In Polytechnics | National Brain Research Centre Scholarships | NTPC Scholarships | National Institute Of Science Communication And Information Resources(NISCAIR) | National Board For Higher Mathematics(NBHM) | National Thermal Power Corporation Ltd.Scholarships | National Olympiad Programme | National Level Science Talent Search Examination - 2005 | Narotam Sekhsaria Scholarship Programme | National Brain Research Centre Scholarships, Post Doctoral Fellowships | National Aptitude Test | NIIT National IT Aptitude Test | Oil And Natural Gas Corporation Ltd (ONGC) Scholarships To SC/ST Students | Office Of The Director General of Civil Aviation Scholarships Stipend to the SC/ST Candidates | Rashtriya Sanskrit Sansthan - Scholarships | Scholarships To Young Artistes | Saf-Madanjeet Singh Scholarship | Sports Authority Of India - Sports Scholarships | SAF-Madanjeet Singh Scholarship | Spic Macay Scholarships | The Childrens Foundation - Scholarships | The L&T Build-India Scholarship | The Hindu-Hitachi Scholarships | The Paul Foundation Scholarships | Technology Information Forecsting and Assessment Council(TIFAC) Women Scientist Scholarship Scheme | The Young Talent IT Scholarship The Dr.GB Scholarships Foundation |

2.5 VARIOUS INTERNATIONAL SCHOLARSHIPS AVAILABLE IN INDIA

A * STAR India Youth Scholarship | A.M.M. Arunachalam-Lakshmi Achi Scholarship For Overseas Study | British Chevening Scholarships | Bharat Petroleum - Scholarships for Higher Studies | Cambridge Nehru Scholarships | Commonwealth Scholarship and Fellowship | Czech Government

Scholarship | Chevening Technology Enterprise Scholarship Programme | Chinese Government Scholarship | Greek Government Scholarships | Israel Government Scholarship | Iranian Government Scholarship | Offer of Italian Government Scholarship | Japanese Government Scholarships | K.C.Mahindra Scholarships For Post-Graduate Studies Abroad | Lady Meherbai D.Tata Scholarships

| Mexican Government Scholarship | Norwegian Government Scholarships | National Overseas Scholarships/Passage Grant for ST Candidates | Portuguese Government Scholarships | Sophia Merit

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Scholarships Inc | Slovak Government Scholarship | SIA Youth Scholarships | The Rhodes Scholarships India | The Ramakrishna Mission Institute Of Culture Award of Debesh-Kamal Scholarships For Studies Abroad | The Inlaks Foundation - Scholarships |

Website for Higher Studies:

1. www.higherstudyabroad.org
2. www.highereducationinindia.com

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3.STUDENT CAREER ORIENTED PROFESSIONAL CERTIFICATION COURSES

As per the career plan for students of MLR Institute of Technology with a view to bridge the gap between Industry and Academia, it has been planned to equip every student with at least three International / National certification by the time he / she completes the course of study. The details of the certification courses are given below:

Branch	**Year**	**Name of the Certification Course**
Computer Science and Engineering / IT / MCA	2nd Year	Certificate Information Technology
	3rd Year	IBM Certified DB2 Database Associate, Infosys Campus Connect
	4th Year	IBM Certified Rational Application Developer
	4th Year	SUN Certified Java Programmer
Electronics and Communication Engineering	2nd Year	Institute of Electronics and Telecommunication Engineering
	3rd Year	Motorola @ CAMPUS
	4th Year	IBM Certified DB2 Database Associate
Aeronautical Engineering	2nd Year	Certificate in AutoCAD
	3rd Year	Certificate in HighPerMesh
	4th Year	Certificate in CATIA

Mechanical Engineering	2nd Year	Certificate in AutoCAD
	3rd Year	Certificate in HighPerMesh
	4th Year	Certificate in CATIA

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4. PERFORMANCE MONITORING AND GUIDANCE

4.1 STUDENT FEEDBACK

In case the students find it difficult to cope up / understand a particular subject, they are advised to discuss it with

a. The Concerned Teacher

b. The Class Teacher

c. The Department Head

d. The Principal

Students can use the suggestion boxes for communicating feedback. Students should mention their names so that they can be informed of the progress / more details / clarifications can be obtained.

4.2 CLASS TEACHER

Every class is assigned a Class Teacher (a faculty member). Students can directly discuss their college related or personal problems related to studies with them. The Class Teachers are accessible to the students and they can talk to the Class Teacher or whenever they are free from class / lab work. Class Teacher will meet with the class representative on daily basis to discuss their day-to-day difficulties if any.

4.3 CLASS REPRESENTATIVES AND THEIR ROLES

Two students from each class are selected as the Class Representatives from the department basing on their academic performance and discipline. Department Head makes the selections.

Responsibilities of the Class Representatives:

- Collection of MIS format from Class Teacher daily.
- Communicating the departmental / college directives & information to the students.
- Collecting the feedback of difficulties faced by the students and communicating Suggestions for improvements.
- Coordinating academic events and co-curricular activities.

- Encourage students to interact for better studies, sharing books and notes.
- Compilation and submission of MIS form to class teacher at the end of the period.

4.4. PERFORMANCE COUNSELING

Mentors will evaluate the student individually for the following:

a. Less marks in internal exams

b. Continuous absence (3 days) and shortage of attendance

c. Not understanding the subject

d. Students from Telugu medium

e. Assistance for back log subjects etc.

f. Communication with parents

g. Provide help to back log students

4.5 REMEDIAL CLASSES / TUTORIAL / REVISIONS

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Remedial Classes are conducted for students who are weak and who do not perform well in their internal examinations / class tests or for the students who want extra help. Slots in the time table have been reserved for Tutorial where in the students are helped to solve the question in the class itself.

4.6. BACKLOG MANAGEMENT

The Mentors maintain a complete record of Examination results of each student and they counsel and guide them in preparing for backlogs. Students are provided with material and important questions are discussed.

4.7. CORRESPONDENCE WITH PARENTS

Parents will be informed about the performance of their ward from time to time in the semester. However parents are requested to be in touch with the Student mentor / Department Head on a regular basis.

5. RULES AND REGULATIONS FOR STUDENTS

5.1 ADMINISTRATIVE

1. Students, admitted into this College, are deemed to have agreed to the rules and regulations of the college, as laid down by the College Authorities from time to time, and the rules lay down in this leaflet, issued at the time of admission.

2. Students should inform **any changes in the addresses/Phone No.** of their parents / guardians to the college office.

3. The college shall communicate to the parents \ guardians of the students from time to time regarding the regularity and performance in the examinations of their wards. The case of serious indiscipline on the part of the students (s) may also be communicated to parent (s) \ guardian (s).

5.2. ACADEMIC

1. Students should **attend the classes in - time**. Late- comers shall not be permitted to enter the class room and they are likely to **loose the attendance**.

2. Students are expected to be regular to the classes. The students Shall not absent themselves for classes without prior approval. **Prior permission** shall be taken from concerned **counselor** and submitted to the **Head of the Department**.

3. In case of **ill-health**, the student should submit the **medical certificate** along with prescription, etc., from a **registered medical doctor**. The student should get the medical certificate within **two days** from the date of reporting to the college after iII health and also

produce a **letter from Father/ Mother** regarding ill-health. Permission on medical grounds shall not be granted for one or two days.

4. The students should come to the laboratories with the **prescribed uniform**.

5. If a student **disturbs the class** or makes mischief, he / she will be marked absent and may be **expelled from the class**.

6. Students shall spend their **leisure time** in the library/computer center.

7. Students are expected to put up the **minimum aggregate percentage of attendance (75%)** as laid down by the JNT University. Students, falling short of 75% of attendance shall not be promoted to the next Semester \ Class.

8. Parents \ guardians of the students can contact the college authorities either in person or by post regarding discipline, regularity in attending classes, performance in the examinations, etc., of their wards.

5.3 DRESS CODE

1. Students are expected to attend the college **properly dressed**. They should wear the prescribed uniform while attending laboratory classes.

2. Students are expected to **carry the identity cards**, issued by the college, in the campus. They are required to show the identity cards at the library, computer center, office, etc. Students without Identity Cards are not allowed in to the laboratory classes.

5.4 DISCIPLINE & PUNCTUALITY

1. No student shall **enter or leave** the class room **without the permission** of the teacher.

2. **Calling students** out of their class rooms while the lecture is in progress is prohibited.

3. Students are required to help in keeping the rooms, buildings, and premises **clean and tidy**. Writing or sticking up of posters and notices on the walls is strictly prohibited.

4. Smoking, Consumption of alcohol, intoxicating drinks or drugs is **strictly prohibited** in and around the college premises. Those indulging in such activities will be put severely or expelled.

5. Students are expected to behave well with the staff, other students and the general public. Any **misbehavior**, coming to the notice of the college authorities, will be severely dealt with.

6. The conduct of the students should be exemplary not only within the premises of the college but also outside. This will help in maintaining the **image and status** of the college.

7. Students are required to **observe silence** at all times in the college campus.They shall not talk in loud tone or call each other by shouting.

8. Students are **prohibited** from loitering in the verandahs / campus during class hours, and sitting on the steps, stair-cases or parapet walls.

9. Students are **not permitted** to resort to strikes and demonstrations within the campus. Participation in such activity entails their dismissal from the college. Any problem they face may be represented to the Counselor / Head of the Department / Principal.

10. Students are **prohibited carrying Cell Phones** and organizing any meeting

or entertainment in the college campus without the permission of the college authorities.

11. The entry of **outsiders without permission** is prohibited. Any student found responsible for bringing outsiders into the campus for settling personal disputes with other students, shall be **expelled** from the college.

12. The college is entitled to take any **disciplinary action**, which is deemed necessary in the case of any indiscipline on the part of the students. The same will be reflected on the **Conduct Certificate** issued at the time of leaving the college.

13. No Student Unions, except **Professional Associations**, are **permitted** in the college.

14. If the students cause any **damage to the college property** knowingly or unknowingly individually or in a group they have to pay **5 times to cost of property** damaged them. All the students are collectively responsible for

the proper maintenance college property i.e. building, furniture, lab equipment, garden, playgrounds, etc., recovery, calculated on semester to semester basis, will be collected along with examination fee for the semester.

15. Students should keep their **vehicles** only at the **parking place allotted** for the purpose. Vehicle riding in the campus is strictly prohibited.

16. Sitting on the parapet wall and Riding beyond the **parking limits**, the fine will be imposed to

    Rs.100.00

17. Breakage or loss of equipment /property as decided by the appropriate authority

18. The Principal/Director may, on the recommendation of the Head of the Department, or otherwise, inflict the **following punishments** in the interests of the student discipline and the Institution: fined, curtailment attendance, denial of promotion to next semester, suspension, expulsion or such other action as deemed necessary for the maintenance of discipline in the campus.

5.5. LAB CLASSES

All students must attend lab classes without fail. Those absent shall follow this procedure laid down in the prescribed format explaining valid reasons and obtain permission to attend the future classes.

5.6 FEE

1. All students admitted into this college, will be required to pay the prescribed tuition fee and other specified fees. Failure of the same will result in the cancellation of admission. No portion of fees will be refunded under any circumstances. If any student wishes to change the college or discontinue the course at any point for any reason, he \ she shall not be permitted to do so unless he \ she pays balance amount of four years fees which he \ she would have to pay, if he \she continued till the completion of the course. His \ Her original certificates including

   I.e., etc., will be issued only after all the dues as stated above, are cleared by the students. All senior students must pay the college fee every year on or before the 15th of July irrespective of the reopening of the college. If they fail the fine will be imposed as per norms of the management.

2. Miscellaneous fee paid for expenditure related to training programs i.e., technical or soft skills etc., is not refundable.

3. Other than the above, if any fees are levied by the University the student has to be pay the same.

5.7 TRANSPORT

All students who are availing the college bus facility must carry the bus-pass and must produce when demanded, failing which they will not allowed to travel in the bus. All students must travel in the allotted bus and routes. They should not change but occupy only their allotted seats throughout. Unauthorized students caught in the bus for not having the bus pass, should pay even if they traveled for one day also. First and second year are not allowed to bring two-wheelers.

5.8 LIBRARY RULES

1. Library Books will be issued for 15 days time and renewal depends upon the demand of the book.

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2. Silence should be strictly maintained in the library.

3. Students are responsible for the library borrower card issued to them. Loss of the library card should be reported in writing to the circulation section immediately. Duplicate library borrower card will be issued on payment of Rs.150/- after a week time from the date of application for duplicate cards.

4. The Library borrower card is not transferable.

5. **Library books must be returned on or before the due date. Any student failed to do so, 1st week –Rs.1/-per day/per book, 2nd week – Rs.2/-per day/per book and 3rd week – Rs.3/-per day/per book penalty will be imposed From 4th week-Rs.5/-per day/per book penalty will be imposed.**

6. Students shall not make any sort of conversation in any part of the library, causing inconvenience to others.

7. Students shall not bring their belongings inside the library and should keep them outside the library.

8. Students leaving from the library should be checked at the exit.

9. Tearing of pages/stealing of books will invite suspension from using of the library facilities and further disciplinary action will be taken against such students, as per college norms.

10. The borrower shall replace the **New book within 7 days, otherwise, he/she has to pay 3 times of the book cost, along with fine**. In case of lose of book.

5.9. GENERAL

1. All the students admitted in this college have to give an **undertaking** to abide by the **rules and regulations** of this college in prescribed format given by the college.

2. All the students **should attend** the college after vacations (Dasara / Sankranthi / Christmas / Semester term / summer) on the **re-opening day** without fail.

3. Students must **deposit all the relevant original certificates and documents** at the time of the admission Office and they will not be returned until completion of the course.

4. Admission of any student can be cancelled by the Management at any point during the course for reasons which are not in consonance with the rules and regulations and which are detrain the reputation of the college.

5. All the Students are here by informed that **college authorities will not take any responsibility** for **loss or theft of your valuable items and money** kept in your bags or somewhere else. Hence I request all the students are not to keep your valuables in class room or anywhere without your presence.

6. **Fee For Issue Of Duplicates**

   a) Duplicate Hall ticket Rs. 100.00

   b) Duplicate Identity Card Rs. 100.00

c) Duplicate College Bus Pass	Rs. 50.00
d) Duplicate Study Certificate for same purpose	Rs. 50.00
e) Xerox copies of OD's	Rs. 50.00

All Breakage etc., penalties will be displayed on the Notice Board, and must be paid by the student and no student will be allowed to write examination or internal test or laboratory test, if penalties are not paid by the due date specified in the notice or circular.

5.10. RAGGING

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Ragging in any form inside or outside the college campus is banned/Prohibited vide Ragging Act 26 of AP. legislative Assembly 1997. Those who indulge in this uncivilized activity are liable for severe disciplinary actions besides being liable for prosecution.

SALIENT FEATURES

Ragging means doing an act which causes or is likely to cause insult 'or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student.

S.No.	Nature of Ragging	Punishment
1	Teasing, Embarrassing and Humiliating	Imprisonment Upto 6 Month or Fine Upto Rs 1000/- or Both.
2	Assaulting or using criminal Force or criminal intimidation	Imprisonment Upto 1 Year or Fine Upto Rs 2000/- or Both.
3	Wrongfully restraining or Confining or causing hurt	Imprisonment Upto 2 Years or Fine Upto Rs 5000/- or Both.
4	Causing grievous hurt kidnapping Or raping or committing unnatural offence	Imprisonment Upto 5 Years or Fine Upto Rs 10000/- or Both
5	Causing death or abating Suicide	Imprisonment Upto 10 Years or fine Upto Rs. 50000/- or Both

Note:

1. A student convicted of any of the above offences, will be, dismissed from the college
2. A student imprisoned for more than six months for any of the above offences 'will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the college immediately.

Prohibition of Ragging:

1. Ragging is prohibited as per act 26 of AP. Legislative assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the college.
4. Outsiders are prohibited from entering the college premises without permission.
5. All students must carry their identity cards and show them when Demanded.

6. The principal and staff will visit and inspect the rooms at any time.

7. Suspended students are debarred from entering the campus except when required to attend enquiry and to submit an explanation

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6. ACADEMIC REGULATIONS R16 FOR B.TECH. (REGULAR)

(Applicable for the students of B.Tech (Regular) from the Academic Year 2017-2018 onwards)

6.1. AWARD OF B.TECH. DEGREE

A Student will be declared eligible for the award of the B.Tech. Degree if he fulfills the following academic regulations:

i) The candidate shall pursue a course of study for not less than four academic years and not more than eight years

ii) After eight academic years of course of study, the candidate is permitted to write the examinations for two more years

iii) The candidate shall register for 176 credits and secured 176 credits with compulsory subjects as listed in Table-1

Table-1: Compulsory Subjects

S.No.	Subject Particulars
1.	All practical subjects
2.	Industry oriented mini project
3.	Comprehensive Viva-Voce
4.	Seminar
5.	Project work

6.2 The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

6.3 COURSES OF STUDY

The following courses of study are offered at present as specializations for the B.Tech courses

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science Engineering
08	Chemical Engineering
10	Electronics and Instrumentation Engineering
12	Information Technology
14	Mechanical Engineering(Mechatronics)
17	Electronics and Telematics Engineering
18	Metallurgy and Material Engineering
19	Electronics and Computer Engineering
20	Mechanical Engineering(Productions)
21	Aeronautical Engineering
22	Insrumentation and Control Engineering

23	Biotechnology
24	Automobile Engineering
25	Mining Engineering
26	Mining Machinery
27	Petroleum Engineering
28	Civil and Environmental Engineering
29	Mechanical Engineering(Nano Technology)
30	Agricultural Engineering
31	Computer Science & Technology

6.4 CREDITS

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03+1/03	06	04	03
	02	04	---	---
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 03
Mini Project	---	----	---	02
Comprehensive Viva Voce	---	--	---	02
Seminar	---	---	06	02
Project	---	---	15	10

6.5 DISTRIBUTION AND WEIGHT AGE OF MARKS:

i. The performance of a student in each semester / I year shall be evaluated subject – wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition,

Industry oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks respectively.

ii. For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

iii. For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid-term examination consists of one objective paper, one essay paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill in the blanks and matching type of questions for a total of 10 marks.

Pattern of the question paper is as follows:

PART–A

Consists of ***one compulsory question*** with five sub questions each carrying one mark. For the I-Mid examinations the sub question would be from first 2 ½ units and for the II-Mid examination the sub

question would be from the remaining 2 ½ units.

PART-B

Consists of five questions (out of which students have to answer three questions) carrying five marks each. Each question there will be an **"either" "or"** choice (that means there will be two questions from each unit and the student should answer any one question). The questions can consist of sub questions also.

The mid-essay paper shall contain 3 sections, each sections consist of two questions from each unit third section consist of two questions from half unit covered in the syllabus out of which student has to answer 1 question from each section, carrying 4+4+2 marks.

The first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate.

The external paper consists of two sections

Part A: compulsory questions carrying 25 marks

Part B: Totally 10 questions are given from all five units carrying 50 marks. Two questions from each unit will be given & one has to be answered each of 10 marks.

The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:

- ***The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.***
- ***Part-A is compulsory question which consists of ten sub-questions. The first five subquestions are from each unit and carries 2 marks each. The next five sub-questions are one from each unit and carries 3 marks each.***
-

Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)

iv. For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

v. There shall be an industry-oriented Mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini-project and its report shall be evaluated along with the project work in IV year II Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. It shall be evaluated for 50 marks. The committee

consists of an external examiner, head of the department, the supervisor of the mini-project and a senior faculty member of the department. There shall be no internal marks for industry-oriented mini-project.

vi. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar

vii. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and

two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he studied during the B. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

viii. Out of a total of 200 marks for the project work, 50 marks shall be allotted for Internal Evaluation and 150 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the project work shall be conducted by the same committee as appointed for the industry-oriented mini-project. In addition, the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from one another. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

ix. The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University rules and produced before the Committees of the University as and when asked for.

6.6 ATTENDANCE REQUIREMENTS:

i. A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

ii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.

iii. Shortage of Attendance below 65% in aggregate shall not be condoned.

iv. A student who is short of attendance in semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.

v. Students whose shortage of attendance is not condoned in any semester/I year are not eligible to write their end semester examination of that class and their registration stands cancelled.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance.

vii. A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities

viii. If any candidate fulfills the attendance requirement in the present semester or I year, the shall not be eligible for readmission into the same class.

6.7 MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

i. A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

ii. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

iii. A student will not be promoted from II year to III year unless he fulfills the academic requirement of 44 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

iv. A student shall be promoted from III year to IV year only if he fulfills the academic

requirements of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

v. A student shall register and put up minimum attendance in all 176 credits and earn 176 credits. Marks obtained in the best 176 credits shall be considered for the calculation of percentage of marks.

vi. Students who fail to earn 176 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech course and their admission stands cancelled.

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7. COURSE CALENDAR FOR THE YEAR

Commencement of class work

1st spell of Instructions (Weeks)

I mid term exams (week)

2nd spell of Instructions (weeks)

II mid term exams (week)

Preparations & Practical examinations (week)

End examinations (weeks)

Commencement of class work for

A.Y.2017-18 II sem

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8. II YEAR I SEMESTER COURSE STRUCTURE

Code	Subject	L	T/P/D	Credits
MA301BS	Mathematics - IV	4	1	4
EE302ES	Electromagnetic Fields	4	1	4
EE303ES	Electrical Machines – I	4	1	4
EE304ES	Network Theory	3	-	3
EE305ES	Electronic Circuits	3	-	3
EE306ES	Electrical Machines Lab - I	-	3	2
EC306ES	Electronic Devices & Circuits Lab	-	3	2
EE307ES	Networks Lab	-	3	2
*MC300ES	Environmental Science And Technology	3	-	0
	Total	**21**	**12**	**24**

Note: All End Examinations (Theory and Practical) are of three hours duration.

T-Tutorial **L – Lecture** **P- Practical** **C – Credits**

HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE
(COLLEGE OF ENGINEERING)
Bogaram (V), Keesara (M), R.R. Dist – 501 301

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

HAND BOOK FOR MATHEMATICS IV

PROGRAMME: B.Tech ECE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: MATHEMATICS-IV	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: Mr.S.Prakash
COURSE CODE: MA301BS REGULATION:**R16**	COURSE TYPE: **REGULAR**
COURSE AREA/DOMAIN: H & S	CONTACT HOURS: 4 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

SYLLABUS

B tech. II Year I Sem.

L	T	P	C
4	1	0	4

Prerequisites: Foundation course (No Prerequisites)**.**

Course Objectives: To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

Course Outcomes: After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using

Cauchy's integral theorem

- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in term of sines and cosines
- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation

UNIT – I

Functions of a complex variable: Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method

UNIT - II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series-Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

UNIT – III

Evaluation of Integrals: Types of real integrals:

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$,$\int_{c}^{c+2c} f(cosx, sinx)dx$

Bilinear transformation- fixed point- cross ratio- properties- invariance of circles.

UNIT – IV

Fourier series and Transforms: Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, inverse transforms, Finite Fourier transforms.

UNIT – V

Applications of PDE: Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.

TEXT BOOKS:

1. A first course in complex analysis with applications by Dennis G. Zill and Patrick Shanahan, Johns and Bartlett Publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
3. Advanced engineering Mathematics with MATLAB by Dean G. Duffy

REFERENCES:

1. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
2. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.

UNITWISE PLANNER

UNIT	DETAILS	HOURS
I	***UNIT – I*** **Functions of a complex variable:** Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method	10
II	***UNIT - II*** **Complex integration:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).	15
III	***UNIT-III*** *Evaluation of integrels-Types of real integrals:* ***a)*** *Improperrealintegrals* $\int_{-\infty}^{\infty} f(x)dx, \quad \int_{c}^{c+2\pi} f(cos\theta, sin\theta)d\theta$ *Bilinear transformation-fixed point-cross ratio-properties-invariance of circles*	10
IV	***UNIT – IV*** **Fourier series and Transforms:** Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series. Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and	13

	cosine, transforms, properties, inverse transforms, Finite Fourier transforms.	
V	***UNIT – V*** **Applications of PDE:** Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.	12

SESSIONPLANNER

		Lesson Plan						
II B.Tech I Sem		MATHEMATICS-IV	2018-19					
S.no	**Unit no**	**Topic**	**Week**	**No of sessions planned**	**Mode of teaching BB/PPT/ OHP/MM**	**Reference ***	**Remarks**	
1	**UNIT-I**	Functions of a Complex variables:Introduction		1	BB	1.1		
2		Concepts of limits and continuity		1	BB	1.2-1.8		
3		Concepts of differentiability and analyticity		1		1.9		
4		analyticity properties		1	BB	1.9		
5		Cauchy -Riemann equations in Cartesian and polar coordinates		2	BB&ppt	1.13		
6		Tutorial class		1	BB			
7		Harmonic functions		2	BB	1.15		
8		Conjugate harmonic function		1	BB	1.16		
9		Milne -Thompson method		2	BB&ppt	1.19		
10		Tutorial class		1	BB			
11		Total class		13				
12	**UNIT-II**	Complex Integration:Line integral		1	BB	2.1		
13		Cauchy's integral theorem		2	BB&ppt	2.4		
14		Cauchy's integral formula		2	BB	2.5		
15		Tutorial class		1	BB			
16		Generalized integral formula		1	BB	2.8		
17		Power series : Taylor's series		2	BB	3.1		
18		Laurent series		1	BB	3.4		
19		Tutorial class		1	BB			
20		Sinular points and types		1	BB&PPT	4.1		
21		Residue & Cauchy Residue theorem		3	BB	4.4		
22		Tutorial class		1	BB			
23		Total class		16				

24	**UNIT-III**	Evaluation of integrals : TYPE -I method		1		5.1		
25		Type-II&III		3	BB	5.2-5.3		
26		Tutorial class		1	BB			
27		Bilinear transformation,Properties of bilinear transformations		2	BB	6.1		
28		Determination of bilinear transformations		2	BB	6.2		
29		Tutorial class		1	BB			
30		Total class		10				
31	**UNIT-IV**	Fourier series &Transforms:Introduction		1	BB&PPT	7.1		
32		Periodic &Fourier series of periodic functions		2	BB	7.2		
33		Dirichlet conditions , Even &Odd functions		2	BB	7.4-7.9		
34		Tutorial class		1	BB			
35		Fourier Integral theorem,Fourier sine &cosine transforms		2	BB	8.1		
36		properties,inverse transforms		2	BB&PPT	8.2		
37		Finite fourier transforms		2	BB	8.3		
38		Tutorial class		1	BB			
39		Total class		13				
40	**UNIT-V**	Applications of PDE:Classification of second order PDE		1	BB&PPT	9.1		
41		Method of separation of variables		2	BB	9.2		
42		Solution of one dimensional wave equation		4	BB	9.3		
43		Solution of one dimensional heat equation		4	BB	9.4		
44		Tutorial class		1	BB			
45		Total class		12				

TEXT BOOKS

T1 Afirst course in complex analysis with applications by Dennis G,Zill &Patrik Shanahan, Johns &Bartlett Publishers

T2 Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers

T3 Advanced Engineering Mathematics with MATLAB by Dean G.Duffy

REFERENCE BOOKS

R1 Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.

R2 Fundamentals of Complex Analysis by Staff , E.B.&A.D Snider, Pearson

R3 Advanced Engineering Mathematics with Louis C.Barrett, McGraw Hill

QUESTION BANK

Unit-1 :FUNCTIONS OF A COMPLEXVARIABLE

Short questions:

1. Define analytic function
2. Define Harmonic function
3. State Cauchy-Riemann equations
4. Write Cauchy-Riemann equations in polar form
5. Show that $u = \frac{x}{x^2+y^2}$ is harmonic.

Long questions

1. State and prove Cauchy- Riemann equations .(5m)

2.Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|real f(z)^2| = 2|f(z)|^2$ where f(z) is analytic.(5m)

3.Prove that z^n is analytic and hence find its derivative.(3m)

4. Determine p such that the function f(z) $=\frac{1}{2}\log(x^2+y^2) + i\tan^{-1}(\frac{px}{y})$ be an analytic function.(5m)

5.Showthat u(x,y)=e^{2x}(x cos2y – y sin2y) is Harmonic and Find its harmonic conjugate.

6.State and prove Cauchy Integral formula.(5m)

7.Find the analytic function whose real part is u = e^{2x}(x cos2y-y sin2y).

8.If the potential function is $\log(x^2 + y^2)$, find the complex potential function.

9.Show that the function $f(z) = sinx\ coshy + i\, cosx\ sinhy$ is continuous as well as analytic every where.

10.state the necessary condition for f(z) to be analytic in Cartesian co-ordinates.

11.If u is a harmonic function , show that w = u^2 is not a harmonic unless u is constant.

12.Find the orthogonal trajectories of the family of curves $x^3y - xy^3 = c$ where c is constant .

13.find the orthogonal trajectories of the family of curves $r^2cos2\theta = c$.

14.Show that an analytic function with constant absolute value is constant.

15.Show that both the real and imaginary parts of an analytic function satisfies laplace's equation.

16.Find whether f(z) =$\frac{x-iy}{x^2+y^2}$ isanalytic or not .

17. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.

18. Show that $f(z) = cosz$ is analytic every where in the complex plane and find $f1(z)$.

19.Find k such that f(x , y)= x^3 +3kxy^2 may be harmonic and find its conjugate .

20. If f(z) = u+iv is analytic , and $v = \frac{2sinxsiny}{cos2x+cosh2y}$.

II) Multiple Choice Questions :

1) Derivative of a Analytic function is ----------( )
   a) continuous b) Analytic c) Differentiable d) None

   Ans: b

2) Cauchy- Riemann equations are-----( )
   a)$u_x = v_y$ and $v_x = - u_y$ b) $u_x = v_y$ and $v_x = u_y$ c) $u_x = u_y$ and $v_x = v_y$ d)none

   Ans:a

3) A continous function is differential ----------( )

   (a) True ,(b) False. (c)True & False, (d) True or False

Ans:a

4) A function Φ(x, y) satisfying Laplace equation is called --------( )

(a) Analytic (b) Holomorphic (c) Harmonic, (d)Non-hormonic

Ans:c

5) Afunction f(z) = cosz is ----------( )

(a) Analytic everywhere , (b) Analytic nowhere (c) only differentiable, (d) None

Ans: a

6) If f(z) = u + iv is analytic in the z-plane , then v-iu is ----------( )

a)Analytic b) not analytic c) continuous d) none

Ans: a

7) An analytic function with constant modulus is ---------- -( )

(a) Constant , (b) not constant , (c) analytic , (d) None of these.

Ans: a

8) A Milne – Thomson method is used to construct ----------( )

a) analytic function , b) Continuous function c) differentiable function, d) None of these Ans:a

9. harmonic conjugate of e^xcosy is …….

a) e^xcosy + c (b) e^xsiny + c (c) e^x + c (d) None of these

10) The harmonic conjugate of e^{-y}sinx is …….

a) e^{-y}cosx + c (b) e^{-y}sinx + c (c) e^{-x} Siny (d) None of these Ans: c

11. The harmonic conjugate of $x^3 - 3xy^2$ is ----------

Ans:$3x^2y - y^3 + c$

12.C-R equations for a function to be analytic in polar form are -------

Ans: $u_r = \frac{1}{r}v_\theta$, $v_r = -\frac{1}{r}u_\theta$

13. The value of k so that $x^2+2x+ky^2$ may be harmonic is ------

Ans-1
:

14. A point at which f(z) fails to be analytic is called ---------- of f(z) Ans: singular point

.

15)A Continous function is ----------:
Ans: Bounded. .

16) A function $\Phi(x, y)$ satisfying Laplace equation is called----------
Ans: Harmonic function.

17).function f(z) = e^z is called----------
Ans: Analytic every where in C

18) If f(z) = u – iv is analytic in the z-plane , then the C-R equations satisfied by it's real and imaginary parts are ----------
Ans: Not analytic everywhere.

19) An analytic function with constant

modulus is----------
. Ans: Constant
20) A Milne – Thomson method is used to construct ----------

Ans: Analytical function.

Unit-2 : COMPLEX INTEGRATION

Short questions:

1. State Cauchy's (integral) theorem.
2. State Cauchy's integral formula
3. Expand $f(z) = sinz$ in Taylor's series about $z = \frac{\pi}{4}$
4. State Taylor's theorem
5. State Laurent's theorem
6. State Cauchy's Residue theorem
7. Find residue of $f(z) = \frac{z}{z^2+1}$ at its poles

Long questions :

1. Evaluate $\int \frac{e^{2z}}{(z-1)(z-2)}$dz where c is the circle $|z|$=3.

2. Expand e^z as Taylor series about z=1.

3. Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.

4. Find the residue of $\frac{ze^z}{(z-1)^3}$ at its poles.

5. Evaluate $\int \frac{e^{2z}}{(z-1)(z-2)}$dz where c is the circle $|z|$=3.

6. Expand e^z as =∞Taylor series about z=1.

7.Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.

8.Find the residue of $\frac{ze^z}{(z-1)^3}$ at its poles.

9.State and Prove Cauchy theorem.

10.State Laurent's theorem and give example.

11.Evaluate using cauchy's integral formula $\int_c \frac{e^{2z}}{(z-1)(z-2)}\, dz \text{ where } c \text{ is the circle } |z| = 3.$

12. Find taylor's series expantion for the function f(z) $=\frac{1}{(1+z)^2}$ with center at –i

13. Find the residue of $\frac{1}{(z-sinz)}$ at z = 0 .

14. .Find the residue of $\frac{z^2}{1-z^4}$ at those poles which lie inside the circle $|z| = 1.5$.

15.find the poles and residues at each pole of $\frac{2z+1}{1-z^4}$.

16.Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.

17. Evaluate $\int_c^{\infty} \frac{Ze^z}{(Z+2)^3}\, dz \text{ where } c \text{ is } |z| = 3$ using cauchy's integral formula .

18. State and Prove Cauchy's integral formula .

19. Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$ along the paths i) y= x ii) y=x^2 .

20.Find the poles and residues at each pole of $\frac{cotz\ cothz}{z^3}$.

Multiple choice :

1). The fixed points of the transformation w=z^2 are

a)0,1 b)0,-1 c)-1,1 d)i,-i

Ans: d

2.A mapping which preserves the angles between oriented curve in magnitude as well as in sense is called

a)conformal mapping b)non-conformal mapping c)function d)none

Ans: a

3. A critical point of the transformation $w = z^2$ is

a)z=i b)z=-i c)z=0 d)no critical points.

Ans: a

4. The value of $\int \frac{dz}{z^2-2z}$ where C is $|z-2|$ =1 is -------( )

a) –πi b)πi c) 2πi d) 0

Ans: b

5. The value of $\int \frac{cosz}{z}$ dz , where C is the ellipse $9x^2 + 4y^2 = 1$ --------( )

a)0 b) πi c) 2πi d) 4πi

Ans:c

6. The Value of $\int \frac{dz}{z^2-1}$ where C is the circle $x^2 + y^2 = 4$ is ----------( )

a)0 b))πi c) –πi d) 2πi

Ans:a

7.The value of $\int tan2\pi z$ dz where c is the circle $|z|$ = 1 is ----------( )

a) 0 b) πi c)2 πi d)-2 πi

Ans:a

8. The period of the function e^{iz} is -----( )

a)π b)2 π c)4 π d) πi

Ans:b

9. The value of $\int_0^{1+i} z\, dz$ along the line z = 0 to z=1+i is ----------( )

a)0 b)i c)2i d)-2i

Ans: b

10. A continuous arc without multiple points is called a ------( )

a) continuous arc b) contour c) Jordan arc d) none

Ans: b

1. A point at which a function f(z) ceases to be analytic is called----------
   Ans: singular point
2. siniz is equal to ----------
   Ans: i sinhz
3. 13.The period of tanz is----------
   Ans: π
4. Real part of cosh z is ----------
   Ans: Coshx cosy
5. 15.w=log z is analytic everywhere except at z=----------
   Ans: zero
6. 16. Imaginary part of e^{2z} is ----------
   Ans: e^{2x} sin2y
7. 17.Cauchy's integral theorem is applicable only for a ---------- region R enclosed a simple curve c.
   Ans simply connected
8. 18.A sequence with more than one limiting point is ----------
   Ans: can not be convergent.
9. 19.A power series within its circle of convergence----------
   Ans: converges absolutely and uniformly.
10. 20.Every analytic function in a simply connected domain possess----------
    Ans: posses an indefinite integral.

UNIT:3 EVALUATION OF INTEGRALS AND BILINEAR TRANSFORMATIONS

Short questions:

1. Define contour integration.
2. Define conformal mapping.
3. Define Bilinear transformation
4. Show that the bilinear transformation preserves the cross ratio
5. Find the fixed point of the transformation $w = \frac{3z-4}{z-1}$

6. Find the image of the circle $|z| = 2$ under the transformation $w = z + 3 + 2i$
7. Determine the region of w-plane into which the region is mapped by the transformation $w = z^2|z - 1 = 2|$

Long questions:

1. Show that $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}$ (a>b>0) using Residue theorem.
2. Use Residue Theorem to evaluate $\int_0^{\infty} \frac{dx}{x^4+a^4}$
3. Determine the linear fractional transformation that maps $z_1=0, z_2=1, z_3=\infty$ onto $w_1=-1, w_2=-i, w_3=1$ respectively.
4. 4.Find the bilinear transformation which maps the points (-1,0,1) into the points(0,i,3i).
5. Find the fixed points of the transformation (1)$w=\frac{2i-6z}{iz-3}$ (2) $w=\frac{z-1}{z+1}$
6. Prove that the Bilinear transformation is conformal.
7. Show that the bilinear transformation preserves the cross ratio.
8. Show that the transformation $w = \frac{2z+3}{z-4}$ changes the circle $x^2 + y^2 - 4x = 0$ into the straight line $4u+3=0.\infty$
9. Evaluate $\int_0^{\infty} \frac{dx}{x^6+1}$ using Residue theorem.
10. Evaluate $\int_0^{2\Pi} \frac{\cos 2\phi}{5+4\cos\phi}$d using Residue Theorem..
11. Show that $\int_0^{\pi} \frac{d\theta}{(5-3\sin\Theta)^2}$ using Residue theorem .
12. Show that $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta} = \frac{2\pi}{\sqrt{3}}$.
13. Find the bilinear transformation which transform the points (∞, i , o) in the z- plane into the points (0,i, ∞) in the w-plane.
14. Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).
15. Show that the relation $w = \frac{5-4z}{4z-2}$ transforms the circle of radius unity in the w –plane.
16. Evaluate $\int_0^{2\pi} \frac{\sin^2\Theta d\theta}{a+b\cos\theta}$ using residue theorem .
17. Show that I= $\int_0^{2\pi} \frac{1+4\cos\Theta d\theta}{17+8\cos\theta}$.
18. Evaluate $\int_0^{\infty} \frac{dx}{(x^2+a^2)^2}$.
19. Evaluate $\int_{-\infty}^{\infty} \frac{(x^2-x+2)dx}{x^4+10x^2+9}$ using residue theorem .
20. Evaluate by contour integration $\int_0^{\infty} \frac{dx}{1+x^2}$.

Fill in the blanks

1) Another name of bilinear transformation is ----------

Ans: Mobious transformations

2) critical points of the mapping w=cosh z are ----------
Ans: z=± nπi , n=0,±1,±2,…….

3) The critical point of the transformation w=$z^2$is z -------
Ans:0,1

4) The cross-ratio of four points $z_1,z_2,z_3,z_4$is ------
Ans:$\frac{(z_1-z_2)(z_3-z_4)}{(z_1-z_4)(z_3-z_2)}$

5) Bilinear transformation always transforms circles into ------
A: circles

6) The invariant points of the transformation w = $\frac{1+z}{1-z}$ are z = ------
A: ±i

7) The critical point of the mapping w^2 = (z-a)(z-b) is ------
A: z= (a+b) / 2

8) The critical points of the mapping w = z + $\frac{1}{z}$ are -------
A:z=±i

9) The bilinear transformation which maps z = 1,i,-1 respectively onto w = i, 0,-i is----------
A: w=$\frac{i-z}{i+z}$

10) The point where $f'(z) = 0$ is called ------- -- of the transformation w = f(z).
A: critical point

<u>Multiple choice questions:</u>

11) The singular point of f(z)=$\frac{1-z}{1+z}$ is
a)z=1 b)z=-1 c)z=i d)z= -i

Ans: b

12) .The fixed points of w= $\frac{z}{2-z}$ are

a)0,1 b)1,-1 c)-1,0 d)0

Ans:a

13) . If the mapping w=f(z) is conformal then the function f(z) is
a)analytic b)non-analytic c)harmonic d)none

Ans:a

14) .The points whch are mapped on to themselves under a conformal mapping are called
a. a)fixed points b)identity points
c)conformal points d)none
Ans:a

15) . The fixed points of the transformation w= $\frac{z-1+i}{z+2}$ are
a. a)z=±1 b)z =±i c)z=-1,±i d)z=1,±i
Ans:c

16) . A critical point of the transformation $w=z^2$ is
a. a)z=i b)z=-i c)z=0 d)no criticalpoints
Ans: c

17) The value of $\int_0^{2\Pi} \frac{d\phi}{5-3cos\phi}$ d$\boldsymbol{\phi}$ is
a)0 b)Π/2 c)Π/4 d)none

Ans:b

18) .Poles of cotz are ----
a)z=nΠ b)2Π c)Π d)none

Ans:a

19) The critical points of the mapping w=cosz are
a)np b)2p c)p d)none.

Ans:a

20) . The fixed points of the transformation w =$\frac{6z-9}{z}$ are
a)z=3,3 b)z=-3,3 c) z= -3.-3 d)z=3i

Ans:b

UNIT-4 : FOURIER SERIES AND FOURIER TRANSFORM

Short questions &long questions:

1. Define periodic function and write examples .
2. Define even and odd function .
3. Express the function f(x) as the sum of an even function and an odd function .
4. Find the functions are even or odd (i) x sinx+cosx+x^2coshx (ii)xcoshx+x^3sinhx.
5. if f and g are periodic functions with same period T show that (af+bg)are also periodic function of period T where a and b are real numbers.
6. Define Euler's formulae.
7. Write Dirichlet's conditions.
8. If f(x)= x^2 2 in (-2,2) then find b_n.
9. If f(x)= x^2 in (-2,2) then a_n.
10. If f(x)= $\sin^3 x$ in (-Π,Π) then find a_n .
11. Find the Fourier series of f(x) =x+x^2 ,-π<x<π .
12. Obtain the Fourier series in(-π,π) for the function f(x)=x-π .
13. Expand the function f(x) =x^3 as Fourier series in –π<x<π .
14. Find the Fourier series for the function f(x)=sin ax.
15. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].
16. Find the fourier series to represent f(x)= x^2 -2 when -2<x<2 .
17. Find Fourier cosine and sine transforms of e^{-ax} ,a>0 and hence deduce the inversion formula .
18. Find the inverse fouriercosine transform f(x) of $F_C(p) = P^n e^{-ap}$

19. Find the fourier cosine transform of $e^{-ax}\cos ax$.
20. Find fourier sine and cosine transforms of xe^{-ax}.

Fill in the blanks

1) IF $F(X) = x^2$ in $(-l, l)$ then b_1= ----------

A: zero

2) If $f(x) = x \cos x$ in$(-\Pi, \Pi)$ then b_1 = ------

A:zero

3) The half range sine series for f(x)= 1 in (0, Π) is -------

A: $\frac{4}{\pi}(\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + \ldots\ldots\ldots\ldots)$

4) In the half range cosine series of f(x) =x sinx ,0<x<Π ,the value of a_0 ------

A: 2

5) The trigonometrical series of f(x) in the interval (-Π,Π) is --------

A: $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$

6) $F_s(2e^{-5x}+5e^{-2x})$= ---------

A: $\frac{2p}{p^2+25} + \frac{5p}{p^2+4}$

7) Fourier sine transform of e^{-x} is -------

A: $\frac{p}{1+p^2}$

8) modulation theorem for fourier transforms states that --------

A: $F(f(x)\sin ax) = \frac{1}{2i}(F(p+a) - F(p-a))$

9).Fourier sine transform of $f(x)= \frac{1}{x}$ is --------

A: $\frac{\pi}{2}$

10) The Fourier sine transform of $\frac{e^{-ax}}{x}$ is -------

A: $\tan^{-1}(p/a)$

11) $F_c(e^{-at})$ = -------

a) $\frac{a}{p^2+a^2}$ b) $\frac{a}{p^2-a^2}$ c) $\frac{2ap}{p^2-a^2}$ d)none

A:a

12. Finite Fourier sine transform of $f(t) = \Pi - t$, $0<t<\Pi$ is -----

a) $\frac{n}{\Pi}$ b) $n\Pi$ c) $\frac{\Pi}{n}$ d)0

A:

13. Continuous functions are sampled to form a

A) Fourier series B) Fourier transform

C) fast Fourier series D) digital image

A: a

14. 2D Fourier transform and its inverse are infinitely

A) Aperiodic b)periodic c)linear d)non linear

A: b

15. Product of two even or two odd functions is

a)Even b) odd c)prime d)aliasing

A:a

16. Odd functions are said to be

a)symmetric b)antisymmetric c) periodic d)aperiodic

A: b

17. Phase angle is represented by formula

a)sine(x/y) b)arcsine(x/y) c)tan(x/y) d)arctan(x/y)

A: d

18. 1. If $x(n)=x_R(n)+jx_I(n)$ is a complex sequence whose Fourier transform is given as $X(\omega)=X_R(\omega)+jX_I(\omega)$, then what is the value of $X_R(\omega)$?

a) $\sum_{n=0}^{\infty} x_R(n)cos\omega n - x_I(n)sin\omega n$
b) $\sum_{n=0}^{\infty} x_R(n)cos\omega n + x_I(n)sin\omega n$
c) $\sum_{n=-\infty}^{\infty} x_R(n)cos\omega n + x_I(n)sin\omega n$
d) $\sum_{n=-\infty}^{\infty} x_R(n)cos\omega n - x_I(n)sin\omega n$ Ans: b

19. . If x(n) is a real sequence, then what is the value of $X_I(\omega)$?

a) $\sum_{n=-\infty}^{\infty} x(n)\sin(\omega n)$
b) $-\sum_{n=-\infty}^{\infty} x(n)\sin(\omega n)$
c) $\sum_{n=-\infty}^{\infty} x(n)\cos(\omega n)$
d) $-\sum_{n=-\infty}^{\infty} x(n)\cos(\omega n)$ Ans:c

20. If x(n) is a real signal, then $x(n)=\frac{1}{\pi}\int_0^{\pi}[X_R(\omega)\cos\omega n - X_I(\omega)\sin\omega n]\,d\omega$

a) True

b) False c)none Ans:a

UNIT-5 APPLICATIONS OF PDE

Short questions &long questions:

1. Define order and degree with reference to partial differential Equation.

2. Eliminate the arbitrary constants ax+by+cz=1.

3. Form PDE by eliminating arbitrary function $z=f(x^2+y^2)$.

4. Define complete integral with reference to nonlinear partial differential equation?

5. Define general integral with reference to nonlinear partial differential equation?

6. Solve $p^2+q^2=m^2$.

7. Solve $z=px+qy+p^2q^2$

8. Write the wave one dimension equation?

9. Write the heat one dimension equation?

10. Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t}+u$ where $u(x, 0) = 6.e^{-3x}$.

11. Solve by the method of separation of variables $2xz_x-3yz_y= 0$.

12. solve the boundary value problem $u_{tt} = a^2u_{xx}$; $0<x<l$; $t>0$ with $u(0,t)= 0$; $u(l,t)=0$ and $u(x,o)=0$,$u_t(x,0)=\sin^3(\frac{\pi x}{l})$.

13. Find the general solution of the wave equation $\frac{\delta^2 u}{\delta t^2} = c^2\frac{\delta^2 u}{\delta x^2}$.

14. Derive the complete solution for the one dimentional heat equation with boundary conditions

problem with initial temperature.

15. Find the physically feasible solution of one –dimensional heat flow equation .

16. write the three possible solutions of $\frac{\partial u}{\partial t} = \frac{\delta^2 u}{\delta x^2}$.

17. A bar 100 cm long with insulated sides has its ends kept at 0^0 C and 100^0 C until steady state conditions.

The two ends are then suddenly insulated and kept so. Find the temperature distribution

18. Find the temperature in a thin metal rod of length of L with both ends insulated and with initial temperature

In the rod is sin ($\frac{\pi x}{L}$).

19. Derive the complete solution for the one dimensional heat equation with zero boundary conditions problem with

initial temperature u (x, 0) = x(L-x) in the interval (0, L)

20. If a string of length l is initially at rest in equilibrium position and each of its points is given the velocity

$v_0 \sin^3 \frac{\pi x}{l}$ find the displacement y (x, t).

MULTIPLE CHOICE QUESTIONS:

1. For partial differential equation, if $b^2 - 4ac = 0$ then equation is called

A. hyperbolic
B. parabolic
C. elliptic
D. None of these

Ans: b

2. Boundary condition which include direct boundary value is

A. Dirichlet boundary condition
B. Neumann boundary condition
C. forced boundary condition
D. discrete boundary condition

Ans: a

3. Region of flow trailing a body where effect of that body is felt on velocity field is called

A. flow region
B. wake
C. trailing region
D. velocity region

Ans: b

4.Measure of circulation of fluid is called

A. stability
B. vorticity
C. viscosity
D. None of these

Ans: b

5.Flow in which each particle of fluid follows an irregular path is called

A. laminar flow
B. turbulent flow
C. mixed flow
D. None of these

Ans: b

6 .The solution of the partial differential equation $yzp + zxq = xy$ is given by

E. A) $x^2 + y^2 = c_1$ and $x^2 + z^2 = c_2$

F. B) $x^2 - y^2 = c_1$ and $x^2 - z^2 = c_2$

G. C) $x^2 + y^2 = c_1$ and $x^2 - z^2 = c_2$

H. D) $x^2 - y^2 = c_1$ and $x^2 + z^2 = c_2$

I. Ans:c

J. 7. The solution of the partial differential equation $xzp + yzq = xy$ is

A) $\phi(x - y, y - z) = c_1$

B) $\phi(xyz) = c_2$

C) $\phi(xz, y) = c_3$

D) $\phi\left(\frac{x}{y}, \frac{y}{z}\right) = c_4$

Ans: d

8. A partial differential equation requires

- (●) exactly one independent variable
- ( ) two or more independent variables
- ( ) more than one dependent variable
- ( ) equal number of dependent and independent variables

Ans: b

9. Using substitution, which of the following equations are solutions to the partial differential equation?

$$\frac{\partial^2 u}{\partial x^2} = 9\frac{\partial^2 u}{\partial y^2}$$

- (●) $\cos(3x - y)$
- ( ) $x^2 + y^2$
- ( ) $\sin(3x - 3y)$
- ( ) $e^{-3x}\sin(xy)$

Ans: d

10.The partial differential equation

$$5\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial y^2} = xy$$

is classified as

- ( ) elliptic
- ( ) parabolic
- ( ) hyperbolic
- ( ) none of the above

Ans: a

Fill in the blanks:

11. The partial differential equation

$$xy\frac{\partial z}{\partial x} = 5\frac{\partial^2 z}{\partial y^2}$$

is classified as----------(●)

( ) Ans: parabolic

( ) ( )

12. The partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial y^2} = 0$$

is classified as ----------

Ans: hyperbolic

Check my answers

13..A partial differential equation has ----------
Ans: two or more independent variables.

14.The partial differential equation

$XY\frac{\partial Z}{\partial x} = 5\frac{\partial Z^2}{\partial Y^2}$ is classified as----------

Ans: Parabolic

15. Laplace equation is------

Ans: $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$

16.$f_{xx}+f_{xy}+f_{yy}=0$ classified as ------

Ans: parabolic

17.One dimensional heat equation is ----------

Ans: $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$

18.One dimensional wave equation is ----------

Ans $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$

19.The equation $xu_{xx}+yu_{yy}=0$ classified as ----------

Ans: Elliptic

20.A Partial differential equations of second order with B2-4AC >0 then it is said to be ----------

-Ans: Hyperbolic

I-ASSIGNMENT TOPICS:

1. State and prove Cauchy- Riemann equations .(5m)
2. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|real f(z)^2| = 2|f(z)|^2$ where f(z) is analytic.(5m)
3. Determine p such that the function f(z) $=\frac{1}{2}\log(x^2+y^2)+i\tan^{-1}(\frac{px}{y})$ be an analytic function.(5m)
4. Show that u(x,y)=e^{2x}(x cos2y – y sin2y) is Harmonic and Find its harmonic conjugate.
5. State and prove Cauchy Integral formula.(5m)
6. .Find the analytic function whose real part is u = e^{2x}(x cos2y-y sin2y).
7. Find whether f(z) $=\frac{x-iy}{x^2+y^2}$ isanalytic or not .
8. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.
9. Show that $f(z) = cosz$ is analytic every where in the complex plane and find $f1(z)$.
10. Find k such that f(x , y)= x^3+3kxy^2 may be harmonic and find its conjugate .
11. If f(z) = u+iv is analytic , and $v = \frac{2sinxsiny}{cos2x+cosh2y}$.
12. Expand e^z as Taylor series about z=1.
13. Find Laurent series expansion of the function f(z)=$\frac{z2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3<z+2<5.
14. Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.
15. Evaluate $\int_c^{\infty}\frac{ze^z}{(Z+2)^3}\,dz\ where\ c\ is\ |z| = 3$ using cauchy's integral formula .
16. State and Prove Cauchy's integral formula .
17. Evaluate $\int_0^{1+i}(x^2-iy)\,dz$ along the paths i) y= x ii) y=x^2 .
18. Find the poles and residues at each pole of $\frac{cotz\ cothz}{z^3}$.
19. Show that $\int_0^{\pi}\frac{d\theta}{a+bcos\theta} = \frac{\pi}{\sqrt{a^2-b^2}}$ (a>b>0) using Residue theorem.
20. Use Residue Theorem to evaluate $\int_0^{\infty}\frac{dx}{x^4+a^4}$

II-ASSIGNMENT TOPICS:

21. Prove that the Bilinear transformation is conformal.
22. Show that the bilinear transformation preserves the cross ratio.
23. Show that the transformation w = $\frac{2z+3}{z-4}$ changes the circle $x^2+y^2-4x=0$ into the straight line 4u+3=0.
24. Show that the transformation w= $\frac{3-z}{z-2}$ transforms the circle $\left|z-\frac{5}{2}\right| = \frac{1}{2}$ in the z plane into the imaginary axis in w plane
25. Evaluate $\int_0^{\infty}\frac{dx}{x^6+1}$ using Residue theorem.
26. Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).
27. Show that the relation w $=\frac{5-4z}{4z-2}$ transforms the circle of radius unity in the w –plane.

28. Evaluate $\int_0^{2\pi} \frac{sin^2\theta d\theta}{a+bcos\theta}$ using residue theorem.
29. Show that I= $\int_0^{2\pi} \frac{1+4cos\theta d\theta}{17+8cos\theta}$.
30. Evaluate $\int_0^{\infty} \frac{dx}{(x^2+a^2)^2}$ .If f(x)= $\sin^3 x$ in (-Π,Π) then find a_n .
31. Find the Fourier series of f(x) =x+x^2,-π<x<π .
32. Obtain the Fourier series in(-π,π) for the function f(x)=x-π .
33. Expand the function f(x) =x^3 as Fourier series in –π<x<π .
34. Find the Fourier series for the function f(x)=sin ax.
35. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].
36. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].
37. Find the Fourier series to represent f(x) = x^2 -2 when -2<x<2 .
38. Expand the function f(x) = x^2 as a Fourier series in $(-\pi,\pi)$ and hence deduce that i)$\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+$ ------- = $\frac{\pi^2}{12}$ ii) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+$ ------- = $\frac{\pi^2}{6}$
39. Using the Fourier integral show that i) e^{-ax}-e^{-bx} = $\frac{2(b^2-a^2)}{\pi}\int_0^{\infty}\frac{\lambda sin\lambda x}{(\lambda^2+a^2)\,(\lambda^2+b^2)}d\lambda$ ii) e^{-x} cosx = $\frac{2}{\pi}\int_0^{\infty}\frac{\lambda^2+2}{\lambda^4+4}\cos\lambda x\, d\lambda$
40. Find Fourier cosine and sine transforms of e^{-ax} ,a>0 and hence deduce the inversion formula .
41. Solve $\frac{\partial u}{\partial x}$ = 2 $\frac{\partial u}{\partial t}$+u where u(x, 0) =6.$e^{-3x}$.
42. Solve by the method of separation of variables $2xz_x$-$3yz_y$= 0.
43. solve the boundary value problem u_{tt} =a^2u_{xx} ; 0<x<l ; t>0 with u(0,t)= 0; u(l,t)=0 and u(x,o)=0 ,u_t(x,0)=$\sin^3(\frac{\pi x}{l})$.
44. Find the general solution of the wave equation $\frac{\delta^2 u}{\delta t^2}$ = $c^2\frac{\delta^2 u}{\delta x^2}$.
45. Derive the complete solution for the one dimensional heat equation with boundary conditions
46. Problem with initial temperature.
47. A string stretched and fastened to two points at x = 0 & x = l motion is started by displacing the string in to the form $\lambda x(l-x)$ *from which it is re*leased at the time t = 0 find the displacement of any point and the string at distance of x from one end at time t

TUTORIAL TOPICS:

1.state the necessary condition for f(z) to be analytic in Cartesian co-ordinates.

2 .If u is a harmonic function , show that w = u^2 is not a harmonic unless u is constant.

3.Find the orthogonal trajectories of the family of curves $x^3y - xy^3 = c$ where c is constant .

4.find the orthogonal trajectories of the family of curves $r^2 cos2\theta = c$.

5.Show that an analytic function with constant absolute value is constant.

6.Show that both the real and imaginary parts of an analytic function satisfies laplace's equation.

7.Find whether f(z) =$\frac{x-iy}{x^2+y^2}$ isanalytic or not .

8. Show that the function f(z) = z $\bar{z}$ is differentiable but not analytic at z = 0.

9. Find taylor's series expantion for the function f(z) =$\frac{1}{(1+z)^2}$ with center at –i

10. Find the residue of $\frac{1}{(z-sinz)}$ at z = 0 .

11. .Find the residue of $\frac{z^2}{1-z^4}$ at those poles which lie inside the circle $|z| = 1.5$.

12.find the poles and residues at each pole of $\frac{2z+1}{1-z^4}$.

13.Expand the Laurent series of $\frac{z^2-1}{(z+2)((z+3))}$ for $|z| > 3$.

14. Evaluate $\int_c^{\infty} \frac{Ze^z}{(Z+2)^3}\, dz \text{ where } c \text{ is } |z| = 3$ using cauchy's integral formula .

15. State and Prove Cauchy's integral formula .

16.Evaluate $\int_0^{2\Pi} \frac{cos2\phi}{5+4cos\phi}$d using Residue Theorem..

17.Show that $\int_0^{\pi} \frac{d\theta}{(5-3sin\theta)^2}$ using Residue theorem .

18.Show that $\int_0^{2\pi} \frac{d\theta}{2+cos\theta} = \frac{2\pi}{\sqrt{3}}$.

19.Find the bilinear transformation which transform the points (∞, i , o) in the z- plane into the points (0,i, ∞) in the w-plane.

20.Find the bilinear transformation which maps the points (1,i , -1) into the points (0,1,∞).

21.Show that the relation w =$\frac{5-4z}{4z-2}$ transforms the circle of radius unity in the w –plane.

22.Evaluate $\int_0^{2\pi} \frac{sin^2\theta d\theta}{a+bcos\theta}$ using residue theorem .

23.If f(x)= x^2 2 in (-2,2) then find b_n.

24.If f(x)= x^2 in (-2,2) then a_n.

25 Expand the function f(x) =x^3 as Fourier series in $-\pi<x<\pi$.

21. Find the Fourier series for the function f(x)=sin ax.

22. Find the Fourier cosine and sine series for f(x) = π-x . in [0,1].

ELECTROMAGNETIC THEORY

PROGRAMME: B.Tech EEE A.YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **Electromagnetic Theory**	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: DR. S.Sivaganesan
COURSE CODE: EE302ES REGULATION:**R16**	COURSE TYPE: **Core**
COURSE AREA/DOMAIN: EEE	CONTACT HOURS: 6 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

BRIEF NOTE ON THE IMPORTANTANCE OF THE COURSE AND HOW IT FITS IN TO THE CURRICULAM

- To introduce the concepts of electric field, magnetic field.
- Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

PREREQUISITES, IF ANY

- Electrostatics
- Dielectrics & Capacitance

MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
There shall be two mid tem examinations. Each Mid-term exam consists of subjective type and objective type test. The subjective test is for 10 marks, with duration of 1 hour Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks. The student is assessed by giving two assignments, one, after completion of 1to 2 1/2 units and the second, after the completion of 2 1/2 to 5 units each carrying 5 marks. On the total the internal marks are 25. The average of two internal tests is the final internal marks. The external question paper is set by JNTUH consisting of part –A and part- B. Where part consists of short answer questions	75	100

carrying total marks of 25 and part part-B consists of 5 essay type questions consists of internal choice each carrying 10 marks and the total of 50. The total external marks are 75.awarded considering the average of two assignments in each course		

EVALUATION SCHEME:

S.No	Component	Total Duration	Marks
1.	I Mid Examination	90 Minutes	20
2.	I Assignment	----	05
3.	II Mid Examination	90 Minutes	20
4.	II Assignment	------	05
5.	External Examination	3 hours	75

Course Objectives:

Prerequisite: Mathematics II & Physics II

- To introduce the concepts of electric field, magnetic field.
- Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

Course Outcomes:

upon completion of course, student will be able to

- Apply vector calculus to static electric – magnetic fields.
- Compute the force, fields & Energy for different charge & current configurations & evaluate capacitance and inductance

- Analyze Maxwell's equation in different forms (Differential and integral) in Electrostatic, Magnetic time varying fields

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

EE302ES: ELECTROMAGNETIC FIELDS

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	4	**1**	**0**	**4**

UNIT – I

Electrostatics: Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div (D)=· v – Laplace's and Poison's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators

UNIT – II

Dielectrics & Capacitance: Behavior of conductors in an electric field – Conductors and Insulators – Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions – Capacitance – Capacitance of parallel plots – spherical co-axial capacitors – with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

UNIT – III

Magneto Statics: Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI)

– MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0,

Ampere's Law & Applications: Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=Jc

UNIT – IV

Force in Magnetic fields and Magnetic Potential: Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.

Self and Mutual inductance – Neumann's formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

UNIT – V

Time Varying Fields: Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl (E)=-· B/· t – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current

COURSE PLAN:

S. No	Unit No	Topic	No of sessions planned	Mode of teaching BB/PPT/ OHP/MM	Reference *	Remarks
1		**:** Electrostatic Fields – Coulomb's Law	1	BB	A1,B1	
2		Electric Field Intensity (EFI) – EFI due to a line and a surface charge	1	BB	A1,B1	
3		Work done in moving a point charge in an electrostatic field – Electric Potential	2	BB	A1,B1	
4		Properties of potential function	1	BB	A1,B1	
5		Potential gradient – Guass's law – Application of Guass's Law	2	BB	A1,B1	
6	I	Maxwell's first law, div (D)=· v – Laplace's	1	BB	A1,B1	
7		Poison's equations – Solution of Laplace's equation in one variable.	2	BB	A1,B1	
8		Electric dipole – Dipole moment – potential and EFI due to an electric dipole	1	BB	A1,B1	
		Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field	2	BB	A1,B1	
		problems	2	BB	A1,B1	
9	II	**Dielectrics & Capacitance:** Behavior of conductors in an electric field	2	**PPT**	A1,B1	

10		Conductors and with composite dielectrics – Energy stored and energy density in a static electric field	1	BB	A1,B1	
11		polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions	1	BB	A1,B1	
		Capacitance – Capacitance of parallel plots – spherical co-axial capacitors				
12		Current density – conduction and Convection current Densities	1	BB	A1,B1	
13		Ohm's law in point form – Equation of continuity	1	**PPT**	A1,B1	
14		Problems	1	BB	A1,C1	
15	III	**Magneto Statics:** Static magnetic fields	1	BB	A1,C1	
16		Biot-Savart's law – Magnetic field intensity (MFI)	2	**PPT**	A1,C1	
17		MFI due to a straight current carrying filament	2	**PPT**	A1,C1	
18		MFI due to circular, square and solenoid current – Carrying wire	2	**PPT**	A1,C1	
19		Relation between magnetic flux, magnetic flux density and MFI	1	BB	A1,C1	
20		Maxwell's second Equation, div(B)=0,	1	BB	A1,C1	
21		**Ampere's Law & Applications:**	2	BB	A1,C1	

22		Ampere's circuital law and its applications viz	2	BB	A1,C1	
23		MFI due to an infinite sheet of current and a long current carrying filament	2	BB	A1,C1	
24		Point form of Ampere's circuital law	1	BB	A1,C1	
31	IV	**Force in Magnetic fields and Magnetic Potential:** Magnetic force	1	BB	A1	
32		Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field	1	BB	A1	
33		Force on a straight and a long current carrying conductor in a magnetic field	1	BB	A1	
34		Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment	2	BB	A1	
35		a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field Scalar Magnetic potential and its limitations	2	BB	A1	
36		vector magnetic potential and its properties – vector magnetic potential due to simple configurations	1	BB	A1	
37		vector Poisson's equations. Self and Mutual inductance – Neumann's formulae	1	BB	A1	

38 39 40 41		determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane	1	BB	A1	
		energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.	1	BB	A1	
42	V	**Time Varying Fields:** Time varying fields	1	BB	A1	
43		Faraday's laws of electromagnetic induction – Its integral and point forms	1	BB	A1	
44		Maxwell's fourth equation, Curl (E)=-· B/· t	1	BB	A1	
45		Statically and Dynamically induced EMFs	1	BB	A1	
46		Simple problems -Modification of Maxwell's equations for time varying fields	1	BB	A1	
47		Displacement current	1	BB	A1	
48		problems	1	BB	A1	

TEXT BOOKS:

1. "William H. Hayt& John. A. Buck", "Engineering Electromagnetics" ,Mc. Graw-Hill Companies, 7th Edition, 2009.

2. "Sadiku", "Electromagnetic Fields", Oxford Publications, 4th Edition, 2009.

REFERENCE BOOKS:

1. "CR Paul and S. A. Nasar", "Introduction to Electromagnetic", Mc-Graw Hill Publications, 3rd Edition, 1997.

2. "Nathan Ida", "Engineering Electromagnetic", Springer (India) Pvt. Ltd. 2nd Edition, 2015.

3. "D J Griffiths", "Introduction to Electro Dynamics", Prentice-Hall of India Pvt. Ltd, 3rd edition, 1999.

4. D J Griffiths", "Introduction to Electro Dynamics", Pearson New International, 4th edition, 2014.

5. "J. D Kraus", "Electromagnetics", Mc Graw-Hill Inc. 4th edition, 1992.

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Objective	Course Outcomes				
	a	**b**	**c**	**d**	**e**
I		S			
II		S	S		
III			H		
IV				H	S

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Outcomes	Program Outcomes													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
a	S													
b	S	S									S		S	S
c	S	S												
d		S					S				S		H	S
e	S		S		S		S				S		S	
f	**S**			**S**						**S**			**S**	
g	**S**			**S**						**S**			**S**	
h		**S**		**S**			**S**							**S**

QUESTION BANK

Objective type:

ELECTROMAGNETIC THEORY MULTIPLE CHOICE QUESTIONS

ELECTROSTATICS

1. The force between two charges is 120 N. If the distance between the charges is doubled, the force will be
(a) 60 N
(b) 30 N
(c) 40 N
(d) 15 N
Ans: b
2. The electric field intensity at a point situated 4 metres from a point charge is 200 N/C. If the distance is reduced to 2 metres, the field intensity will be
(a) 400 N/C
(b) 600 N/C
(c) 800 N/C
(d) 1200 N/C
Ans: c
3. The lines of force due to charged particles are
(a) always straight
(b) always curved
(c) sometimes curved
(d) none of the above
Ans: b
4. The electric field at a point situated at a distance d from straight charged conductor is
(a) proportional to d
(b) inversely proportional to d
(c) inversely proportional to d
(d) none of the above
Ans: b
5. The direction of electric field due +0 positive charge is .
(a) away from the charge
(b) towards the charge
(c) both (a) and (6)
Ans:(d)nonea of the above
6. A field line and an equipotential surface are
(a) always parallel
(b) always at 90°
(c) inclined at any angle 0
Ans:(d)noneb of the above
7. The ability of charged bodies to exert force on 6ne another is attributed to the existence of
(a) electrons
(b) protons
(c) neutrons
Ans:(d)electricd field
8. If the sheet of a bakelite is inserted between the plates of an air capacitor, the capacitance will
(a) decrease
(b) increase
(c) remains unchanged

Ans:(d)becomeb zero
9. A capacitor stores 0.24 coulombs at 10 volts. Its capacitance is
(a) 0.024 F

(b) 0.12 F
(c) 0.6 F
Ans:(d)0.8a F
10. For making a capacitor, it is better to select a dielectric having
(a) low permittivity
(b) high permittivity

(c) permittivity same as that of air

Ans:(d)permittivityb slightly more than that of air

11. The units of capacitance are
(a) volts/coulomb
(b) coulombs/volt
(c) ohms

(d)Ans:henry/Wbb

12. If three 15 uF capacitors are connected in series, the net capacitance is

(a) 5 uF
(6) 30 uF
(c) 45 uF

Ans:(d)50a uF

13. If three 10 uF capacitors are connected in parallel, the net cararitance is

(a) 20 uF

(b) 30 uE
(c) 40 uF

Ans:(d)50b uF

14. A dielectric material must be
(a) resistor
(b) insulator
(c) good conductor

Ans:(d)semib conductor

15. An electrolytic capacitor can be used for

(a) D.C. only
(b) AC. only

Ans:(c)botha D.C. as well as A.C.

16. The capacitance of a capacitor is not affected by
(a) distance between plates
(6) area of plates

(c) thickness of plates

Ans:(d)allc of the above

17. Which of the following is not a vector ?

(a) Linear momentum
(b) Angular momentum
(c) Electric field

Ans:(d)Electricb potential
18. Two plates of a parallel plate capacitor after being charged from a constant voltage source are separated apart by means of insulated handles, then the

(a) Voltage across the plates increases
(b) voltage across the plates decreases
(c) charge on the capacitor decreases

Ans:(d)chargeb on the capacitor increases

19. If A.C. voltage is applied to capacitive circuit, the alternating current can flow in the circuit because

(a) varying voltage produces the charg¬ing and dicharging currents
(b) of high peak value
(c) charging current can flow

Ans:(d) adischarge current can flow

20. Voltage applied across a ceramic dielectric produces an electrolytic field 100 times greater than air. What will be the value of dielectric constant ?

(a) 50

(6) 100
(c) 150

Ans:(d)200b

21. Which of the following statements is correct ?
(a) Air capacitors have a blackband to indicate the outside foil
(6) Electrolytic capacitor must be con¬nected in the correct polarity

(c) Ceramic capacitors must be con¬nected in the correct polarity
(d) Mica capacitors are available in capacitance value of 1 to 10 pF Ans: b
22. The dissipation factor of a good dielectric is of the order of
(a) 0.0002
(b) 0.002
(c) 0.02

Ans:(d)0.2a

23. "The total electric flux through any closed surface surrounding charges is equal to the amount oflcharge enclosed".

The above statement is associated with
(a) Coulomb's square law
(b) Gauss's law
(c) Maxwell's first law

(d) Maxwell's second law

Ans: b

24. Three capacitors each of the capacity C are given. The resultant capacity 2/3 C can be obtained by using them

(a) all in series
(b) all in parallel
(c) two in parallel and third in series with this combination

(d) two in series and third in parallel across this combination Ans: c

25. For which of the following parameter variation, the capacitance of the capacitor remains unaffected ?

(a) Distance between plates
(b) Area of the plates
(c) Nature of dielectric

Ans:(d)Thicknessd of the plates

26. Which of the following statement is true ?
(a) The current in the discharging capacitor grows linearly

(b) The current in the dicharging capacitor grows exponentially
(c) The current in the discharging capacitor decays exponentially
(d) The current in the discharging capacitor decreases constantly Ans: b
27. Which of the following expression is correct for electric field strength ?
(a) E = D/E
(b) E = D2/t

(c) E = jtD

Ans:(d)E=a nD2

28. In a capacitor the electric charge is stored in
(a) metal plates
(b) dielectric
(c) both (a) and (6)

(d)Ans:noneb of the above

29. Which of the following materials has the highest value of dielectric constant?
(a) Glass

(b) Vacuum
(c) Ceramics
(d) Oil
Ans: c

30. Which of the following capacitors will have the least variation ?
(a) Paper capacitor
(b) Ceramic capacitor

(c) Silver plated mica capacitor

Ans:(d)Nonec of the above

MAGNETISM AND ELECTROMAGNETISM

1. Tesla is a unit of

(a) field strength
(b) inductance
(c) flux density
(d) flux

Ans: c

2. A permeable substance is one

(a) which is a good conductor
(6) which is a bad conductor
(c) which is a strong magnet
(d) through which the magnetic lines of force can pass very easily

Ans: d

3. The materials having low retentivity are suitable for making
(a) weak magnets

(b) temporary magnets
(c) permanent magnets
(d) none of the above

Ans: b

4. A magnetic field exists around
(a) iron

(b) copper
(c) aluminium

Ans:(d)movingd charges

7. Ferrites are materials.
(a) paramagnetic
(b) diamagnetic
(c) ferromagnetic

Ans:(d)nonec of the above

8. Air gap has_____eluctance as compared to iron or steel path

(a) little
(b) lower
(c) higher

Ans:(d)zerob

9. The direction of magnetic lines of force is
(a) from south pole to north pole

(b) from north pole to south pole
(c) from one end of the magnet to another

Ans:(d)noneb of the above

10. Which of the following is a vector quantity ? (a) Relative permeability (b) Magnetic field intensity (c) Flux density

Ans:(d)Magneticb potential

11. The two conductors of a transmission line carry equal current I in opposite directions. The force on each conductor is

(a) proportional to 7
(b) proportional to X
(c) proportional to distance between the conductors

Ans:(d)inverselyb proportional to I

12. A material which is slightly repelled by a magnetic field is known as
(a) ferromagnetic material

(b) diamagnetic material
(c) paramag>etic material

Ans:(d)conductingb material

13. When an iron piece is placed in a magnetic field

(a) the magnetic lines of force will bend away from their usual paths in order to go away from the piece

(b) the magnetic lines of force will bend away from their usual paths in order to pass through the piece

(c) the magnetic field will not be affected

Ans:(d)theb iron piece will break

14. Fleming's left hand rule is used to find
(a) direction of magnetic field due to current carrying conductor
(b) direction of flux in a solenoid

(c) direction of force on a current car¬rying conductor in a magnetic field

Ans:(d)polarityc of a magnetic pole

15. The ratio of intensity of magnetisation to the magnetisation force is known as
(a) flux density
(b) susceptibility
(c) relative permeability

(d)Ans:noneb of the above

16. Magnetising steel is normals difficult because
(a) it corrodes easily

(6) it has high permeability
(c) it has high specific gravity

Ans:(d)itdhas low permeability

17. The left hand rule correlates to
(a) current, induced e.m.f. and direc¬tion of force on a conductor
(b) magnetic field, electric field and direction of force on a conductor

(c) self induction, mutual induction and direction of force on a conductor
(d) current, magnetic field and direc¬tion of force on a conductor Ans: d
18. The unit of relative permeability is
(a) henry/metre
(b) henry
(c) henry/sq. m

Ans:(d)itdis dimensionless

19. A conductor of length L has current I passing through it, when it is placed parallel to a magnetic field. The force experienced by the conductor will be

(a) zero
(b) BLI
(c) B2LI

(d) BLI2

Ans: a

20. The force between two long parallel conductors is inversely proportional to
(a) radius of conductors

(b) current in one conductor
(c) product of current in two conduc¬tors

Ans:(d)distanced between the conductors

21. Materials subjected to rapid reversal of magnetism should have
(a) large area oiB-H loop
(b) high permeability and low hysteresis loss

(c) high co-ercivity and high reten-tivity

Ans:(d)highb co-ercivity and low density

22. Indicate which of the following material does not retain magnetism permanently.
(a) Soft iron
(b) Stainless steel
(e) Hardened steel

Ans:(d)Nonea of the above

23. The main constituent of permalloy is
(a) cobalt

(b) chromium

(c) nickel

Ans:(d)tungstenc

24. The use of permanent magnets is. not made in
(a) magnetoes
(6) energy meters

(c) transformers

Ans:(d)loudc-speakers

25. Paramagnetic materials have relative permeability
(a) slightly less than uuity
(b) equal to unity
(c) slightly more than unity

Ans:(d)equalc to that ferromagnetic mate rials

26. Degaussing is the process of

(a) removal of magnetic impurities

(b) removing gases from the materials
(c) remagnetising metallic parts

Ans:(d)demagnetising metallic parts

27. Substances which have permeability less than the permeability of free space are known as

(a) ferromagnetic

(b) paramagnetic
(c) diamagnetic

Ans:(d)bipolarc

28. Two infinitely long parallel conductors in vacuum anf' separated 1 metre between centres >rhen a current of 1 ampere flows thn. ugh each conductor, produce on each otLer a force of
(a) 2 x 1(T2 N/m)
(b) 2 x KT3 N/m
(c) 2 x 10"5 N/m

Ans:(d)2xd 1(T7 N/m)

29. In the left hand rule, forefinger always represents
(a) voltage
(b) current

(c) magnetic field
Ans:(d)directionc of force on the conductor

30. Which of the following is a ferromagnetic material ?
(a) Tungsten
(b) Aluminium
(c) Copper

Ans:(d)Nickeld

MAGNETIC CIRCUIT

1. An air gap is usually inserted in magnetic circuits to
(a) increase m.m.f.
(b) increase the flux
(c) prevent saturation

(d) none of the above

Ans: c

2. The relative permeability of a ferromagnetic material is
(a) less than one

(b) more than one
(c) more than 10

(d) more than 100 or 1000

Ans: d

3. The unit of magnetic flux is
(a) henry
(b) weber
(c) ampereturn/weber

Ans:(d)ampere/metreb

4. Permeability in a magnetic circuit corresponds to_____ in an electric circuit.

(a) resistance
(b) resistivity
(c) conductivity

Ans:(d)conductancec

5. Point out the wrong statement.
Magnetic leakage is undesirable in electric machines because it

(a) lowers their power efficiency
(b) increases their cost of manufacture
(c) leads to their increased weight
(d) produces fringing

Ans: a

6. Relative permeability of vacuum is

(a) 1
(b) 1 H/m
(c) 1/4JI

Ans:(d)4na x 10-' H/m

7. Permanent magnets are normally made of
(a) alnico alloys

(b) aluminium
(c) cast iron

Ans:(d)wroughta iron

8. Energy stored by a coil is doubled when its current is increased by percent. (a) 25

(c)41.4(b)50

Ans:(d)100c

9. Those magnetic materials are best suited for making armature and transformer cores which have____permeability and_____hystersis loss.

(a) high, high
(b) low, high
(c) high, low

Ans:(d)low,c low

10. The rate of rise of current through an inductive coil is maximum (a) at 63.2% of its maximum steady value (b) at the start of the current flow (c) after one time constant

Ans:(d)nearb the final maximum value of current

11. When both the inductance and resistance of a coil are doubled the value of
(a) time constant remains unchanged
(b) initial rate of rise of current is doubled

(c) final steady current is doubled

Ans:(d)timea constant is halved

12. The initial rate of rise of current through a coil of inductance 10 H when suddenly

connected to a D.C. supply of 200 V is_____Vs
(a) 50
(b) 20

(c) 0.05

Ans:(d)500b

13. A material for good magnetic memory should have
(a) low hysteresis loss
(b) high permeability
(c) low retentivity

Ans:(d)highd retentivity

14. Conductivity is analogous to

(a) retentivity
(b) resistivity
(c) permeability

Ans:(d)inductancec

15. In a magnetic material hysteresis loss takes place primarily due to

(a) rapid reversals of its magnetisation
(b) flux density lagging behind magnetising force

(c) molecular friction

Ans:(d)itdhigh retentivity

16. Those materials are well suited for making permanent magnets which have_____retentivity and _____coercivity.

(a) low, high
(b) high, high

(c) high, low

(d)Ans:low,b low

17. If the area of hysteresis loop of a material is large, the hysteresis loss in this material will be

(a) zero
(b) small
(c) large

Ans:(d)nonec of the above

18. Hard steel is suitable for making permanent magnets because (a) it has good residual magnetism

(b) its hysteresis loop has large area
(c) its mechanical strength is high

Ans:(d)itsa mechanical strength is low

19. Silicon steel is used in electrical machines because it has
(a) low co-ercivity

(b) low retentivity
(c) low hysteresis loss

Ans:(d)highc co-ercivity

20. Conductance is analogous to
(a) permeance
(b) reluctance

(c) flux

Ans:(d)inductancea

ELECTROMAGNETIC INDUCTION

1. The property of coil by which a counter e.m.f. is induced in it when the current through the coil changes is known as

(a) self-inductance

(b) mutual inductance
(c) series aiding inductance
(d) capacitance

Ans: a

2As per Faraday's laws of electromagnetic induction, an e.m.f. is induced in a conductor whenever it
(a) lies perpendicular to the magnetic flux
(b) lies in a magnetic field
(e) cuts magnetic flux

(d) moves parallel to the direction of the magnetic field
Ans: c

3. Which of the following circuit element stores energy in the electromagnetic field ?
(a) Inductance
(b) Condenser
(c) Variable resistor

(d) Resistance

Ans: a

4. The inductance of a coil will increase under all the following conditions except (a) when more length for the same number of turns is provided (6) when the number of turns of the coil increase
(c) when more area for each turn is provided
(d) when permeability of the core increases

Ans: a

5. Higher the self-inductance of a coil,
(a) lesser its weber-turns
(b) lower the e.m.f. induced
(c) greater the flux produced by it

(d) longer the delay in establishing steady current through it Ans: d

6. In an iron cored coil the iron core is removed so that the coil becomes an air cored coil. The inductance of the coil will

(a) increase
(b) decrease
(c) remain the same

Ans:(d)initiallyb increase and then decrease

7. An open coil has

(a) zero resistance and inductance
(b) infinite resistance and zero inductance
(c) infinite resistance and normal inductance
(d) zero resistance and high inductance

Ans: b

8. Both the number of turns and the core length of an inductive coil are doubled. Its self-inductance will be

(a) unaffected
(b) doubled
(c) halved

Ans:(d)quadrupledb

9. If current in a conductor increases then according to Lenz's law self-induced voltage will

(a) aid the increasing current
(b) tend to decrease the amount of cur-rent
(c) produce current opposite to the in-creasing current

Ans:(d)aidc the applied voltage

10. The direction of incViced e.m.f. can be found by
(a) Laplace's law
(b) Lenz's law

(c) Fleming's right hand rule

Ans:(d)Kirchhoffb s voltage law

11. Air-core coils are practically free from
(a) hysteresis losses
(b) eddy current losses
(c) both (a) and (b)

Ans:(d)nonec of the above

12. The magnitude of the induced e.m.f. in a conductor depends on the

(a) flux density of the magnetic field
(b) amount of flux cut
(c) amount of flux linkages

Ans:(d)rated of change of flux-linkages

13. Mutually inductance between two magnetically-coupled coils depends on
(a) permeability of the core
(b) the number of their turns

(c) cross -sectional area of their com-mon core

Ans:(d)alld of the above

14. A laminated iron core has reduced eddy-current losses because

(a) more wire can be used with less D.C. resistance in coil
(b) the laminations are insulated from each other
(c) the magnetic flux is concentrated in the air gap of the core

Ans:(d)theb laminations are stacked vertf -cally

15. The law that the induced e.m.f. and current always oppose the cause producing them is due to

(a) Faraday
(b) Lenz
(c) Newton

Ans:(d)Coulombb

16. Which of the following is not a unit of inductance ?

(a) Henry
(b) Coulomb/volt ampere
(c) Volt second per ampere

Ans:(d)Allb of the above

17. In case of an inductance, current is proportional to
(a) voltage across the inductance
(b) magnetic field

(c) both (a) and (b)

Ans:(d)neitherb (a) nor (b)

18. Which of the following circuit elements will oppose the change in circuit current ?
(a) Capacitance
(b) Inductance
(c) Resistance

Ans:(d)Allb of the above

19. For a purely inductive circuit which of the following is true ?

(a) Apparent power is zero

(b) Relative power is.zero
(c) Actual power of the circuit is zero
(d) Any capacitance even if present in the circuit will not be charged Ans: c
20. Which of the following is unit of inductance ?
(a) Ohm
(b) Henry

(c) Ampere turns
Ans:(d)Webers/metreb

QUESTION BANK:

(Short Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I ELECTROSTATICS		
1	Describe the different sources of electric and magnetic fields?	Remember	1
2	What is a scalar quantity and vector quantity?	Understand	1
3	Find the dot product of the vectors A and B if A =2ax-3ay+4az, B= -ax+2ay+2az.	Understand	1
4	Write down expression for x, y, z in terms of spherical co-ordinates r, θ and Φ.	Remember	2
5	Give the limitations of Gauss's law.	Application	1
6	Represent point P (2, 3and 1) m given in Cartesian co-ordinates into cylindrical co-ordinates.	Remember	2
7	Give the relation between three co ordinate systems.	Remember	1
8	State divergence theorem.	Understand	1
9	How is the unit vectors defined in three co ordinate systems?	Remember	2
10	State coulombs' law?	Remember	2
11	State gauss law?	Remember	1

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
12	Write expression for differential length in cylindrical and spherical co-ordinates.	Remember	1
13	What is physical significance of divergence of D?	Remember	1
14	Express the divergence of a vector in the three system of orthogonal Co-ordination.	Understand	1
15	Define dipole and dipole element?	Understand	1
16	Define electric flux and flux density?	Remember	1
17	Define electric field and electric intensity?	Application	1
18	Distinguish electric potential and potential difference?	Remember	1
19	State point form of ohms law?	Remember	2
20	State stokes theorem	Understand	1
21	Define electric scalar potential	Remember	1
22	Obtain Poisson's equation from Gauss's law	Understand	1
	UNIT-II **CONDUCTORS, DIELECTRICS AND CAPACITANCE**		
1	What is an electric dipole? And write down the potential due to an electric dipole.	Remember	2
2	What is displacement current?	Understand	1
3	What is magnetic dipole moment?	Understand	2
4	Define magnetization	Remember	6
5	Define magnetic susceptibility.	Application	2
6	What is the relation between relative permeability and susceptibility?	Remember	2
7	State the boundary conditions at the interface between two perfect dielectrics.	Remember	2
8	What is capacitor? Define the capacitance of a capacitor and state its units.	Understand	2
9	Write the point form of Ohm's law.	Remember	2
10	Define dielectric strength?	Understand	6
11	Define B-H curve for classifying magnetic materials.	Understand	6
12	Classify the magnetic materials.	Remember	6
13	Write the expression for energy stored in an inductor.	Remember	6

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
14	Write the boundary condition for the electric field	Remember	2
15	What are the basic properties of a good conductor?	Understand	6
16	What are the different types of magnetic materials?	Understand	6
17	Define magnetic flux?	Remember	2
18	Define mmf?	Remember	2
19	Define Reluctance and permeance?	Understand	2
20	Define self inductance. Define Mutual inductance.	Understand	2
	UNIT-III **MAGNETO STATICS**		
1	Define Lorentz law of force.	Remember	3
2	State Biot-Savart Law.	Analysis	3
3	State Ampere's circuital law.	Understand	3
4	What is the difference between scalar and vector magnetic potential.	Analysis	3
5	Define Magnetic Moment.	Analysis	3
6	What is magnetic dipole moment?	Remember	2
7	Define magnetic vector potential.	Understand	3
8	Define flux density or energy density in a magnetic circuit?	Remember	3
9	What is the relation between magnetic flux density and field intensity?	Analysis	2
10	Write down the magnetic boundary conditions?	Remember	3
11	Give the force on a current element carrying 10A if the separation of two parallel plates is 1m?	Understand	3
12	A Current of 3A flowing through an inductor of 100mH. What is the energy stored in inductor?	Analysis	3
13	Define magnetization vector?	Remember	2
14	Write Lorentz equation for F = Q (E + (V X B))	Analysis	2
15	What is solenoid?	Understand	3
16	Define magnetic field intensity	Understand	3

17	Give the torque experienced by a current carrying loop placed in a magnetic field?	Understand	3
18	What is the relation between relative permeability and susceptibility?	Understand	3

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
19	Can a magnetic field exist in a good conductor if it is static or time varying? Explain.	Understand	3
20	Write down the equation for general integral and point form of Ampere's law?	Remember	3
21	What is field due to torrid and solenoid?	Understand	3
22	Define magnetic moment?	Remember	3
23	Give torque on closed circuits?	Remember	2
24	What are the major classifications of magnetic materials?	Understand	3
25	State gauss law for magnetic field?	Remember	3
26	Give the similarities between electrostatic and magnetic field?	Understand	3
27	Define magnetic dipole?	Remember	3
28	Define magnetic susceptibility?	Remember	3
	UNIT-IV **FORCE IN MAGNETIC FIELDS AND MAGNETIC POTENTIAL**		
1	State Faraday's law of induction.	Remember	5
2	State Lorentz's law	Remember	5
3	What is motion of charged particle in magnetic field.	Understand	5
4	Define magnetic dipole.	Analysis	4
5	Define self Inductance.	Remember	4
6	Define Mutual Inductance.	Understand	4
7	What is scalar magnetic potential.	Remember	4
8	What is vector magnetic potential.	Understand	4
9	Define propagation constant.	Remember	4
10	Define Polarization of uniform plane wave.	Remember	4
11	For a loss dielectric material having μr=1, ε r=48, σ=20s/m. calculate the propagation constant at a Frequency of 16 GHz	Analysis	4

12	Write down the expression for instantaneous power flow in electromagnetic field and instantaneous Pointing vector?	Analysis	4
13	Define Circular Polarization.	Remember	4
14	Define Elliptical and Linear polarization.	Remember	4
15	Write Helmholtz equation?	Understand	4

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
16	Find the velocity of a plane wave in a lossless medium having a relative permittivity of 5 and relative Permeability is unity?	Remember	4
17	Write down the complex pointing vector in rectangular coordinates?	Analysis	4
18	An EM has Ex and Hx as components of electric and magnetic fields respectively.	Understand	4
19	Find the direction of power of flow.	Analysis	4
20	State Silesian vector?	Understand	4
21	Define surface impedance.	Understand	4
22	Can a magnetic field exist in a good conductor if it is static or time varying? Explain.	Analysis	4
23	In a time varying situation how do you define a good conductor and lossy dielectric?	Analysis	4
24	Write the two dimensional wave equations for a wave travelling in z direction	Remember	4
	UNIT-V **TIME VARYING FIELDS**		
1	Explain faraday law of electromagnetic induction.	Remember	5
2	What is statically induced E.M.F.	Understand	5
3	What is dynamically induced E.M.F.	Understand	5
4	Write Maxwell's equation in point and integral form.	Remember	5
5	What is significance of displacement current density?	Understand	5
6	What is motional E.M.F?	Understand	5
7	What is the E.M.F produced by moving loop in time varying field?	Remember	5
8	What is conduction and displacement current density?	Analysis	5
9	State Pointing Theorem.	Understand	5
10	Explain Faraday's Disc generator.	Analysis	5

11	Give time harmonic Maxwell's equation in point forms. Assume time factor e-iωt .	Understand	5
12	Give the expression for lifting force of an electromagnet.	Understand	5
13	Write the Maxwell's equation from faradays law?	Understand	5
14	Write the Maxwell's equation in differential form.	Analysis	5
15	What is the energy stored expression in a magnetic field?	Analysis	5

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
16	Compare energy stored in inductor and capacitor?	Remember	5
17	Explain why Del dot B is zero?	Remember	5
18	What is the mutual inductance of two inductively tightly coupled coils with self inductance of 25mH and 100 mH ?	Remember	5
19	Explain why curl E is zero?	Remember	5
20	State the flux rule for a nonrectangular loop moving through a no uniform magnetic field.	Analysis	5
21	Give the situations when the rate of change of flux results in a non-zero value.	Understand	5
22	Write the Maxwell's equations from ampere circuital law both in integral and point form?	Analysis	5
23	Tabulate the Maxwell's equation for conducting and free space medium?	Understand	5
24	What is the electric field and power flow in the co axial cable?	Remember	5
25	Write the expression for total current density	Analysis	5

1. Group - II (Long Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I ELECTROSTATICS		
1	State and explain Curl, Gradient and Divergence also find the potential due to an electric dipole.	Understand	1
2	Check validity of the divergence and curl theorem considering the field D=2xy ax+x2ay c/m^2 and the rectangular parallel piped formed by the planes x=0,x=1,y=0,y=2 &z=0,z=3.	Analysis	1
3	Derive poisons and Laplace equations.	Understand	1
4	State and prove Gauss law and explain applications of Gauss law.	Remember	1

5	Define the potential difference and electric field. Give the relation between potential and field intensity. Also Derive an expression for potential due to infinite uniformly charged line and also derive potential due to electric dipole.	Remember	2
6	State and explain a) Stokes theorem b) Divergence theorem c) The electric flux density	Understand	2
7	Find the electric field due to n-charges, and also establish the relation between potential and electric field.	Understand	1
8	Derive an expression for the electric field intensity at any point due to a uniformly line charge with density r_l c/ $_m$	Analysis	1
9	Derive an expression for the electric field intensity at any point due to a uniformly charged sheet with density r_s c/ $_m^2$	Understand	1

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
10	Derive an expression for the electric field intensity at any point due to a volume charge with density r_v c/ ^3_m	Understand	1
11	State gauss law for the electric and magnetic fields. Derive its integral and differential forms. Make at least two conclusions?	Understand	1
12	Define the terms (i) Electric Field Intensity (ii) Electric Potential.	Analysis	1
13	Derive the relation between electric field and electric potential in rectangular co-ordinates.	Analysis	1
14	Define potential difference and derive the express for potential difference $V_{AB.}$	Analysis	1
	UNIT-II **CONDUCTORS, DIELECTRICS AND CAPACITANCE**		
1	Derive the boundary conditions of the normal and tangential components of electric field at the Inter face of two media with different dielectrics	Understand	6
2	Derive the expression for electric potential due to Dipole.	Analysis	2
3	Drive an expression for energy stored and energy density in an Electrostatic field	Understand	2
4	Find the expression for the cylindrical capacitance using Laplace equation.	Remember	2
5	Find the capacitance of a two concentric spherical shells.	Understand	6
6	Derive the expression for co-efficient of coupling.	Understand	6
7	Derive the expression for the energy stored in the parallel plate capacitor.	Understand	6

8	Using the concept of magnetic vector potential, derive Biot Savart's law and amperes law?	Understand	6
9	Derive an expression for the capacitance of a spherical capacitor with conducting shells of radius a and b.	Remember	3
10	Derive the expression for the continuity equation of current in differential form and also derive the expression for inductance of a solenoid with N turns and l meter length carrying a current of I amperes.	Understand	2
11	Derive the express for torque on an Electric dipole placed in electric field.	Understand	2
12	A solenoid has an inductance of 20 mH If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance	Analysis	2
13	Derive the expression for potential energy stored in the system of n-point charges	Understand	2
14	Derive an expression for Poisson and Laplace equations and also Derive an expression for the inductance of solenoid	Remember	2

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
15	Derive the boundary conditions at an interface between two magnetic medias.	Remember	6
	UNIT-III **MAGNETO STATICS**		
1	Derive the expression for magnetic field intensity and magnetic flux density due to finite and infinite line.	Understand	3
2	Derive the expressions for magnetic field intensity and magnetic flux density due to circular coil.	Understand	3
3	Derive an expression for force between two current carrying conductors.	Remember	3
4	Derive the expression for torque developed in a rectangular closed circuit carrying current I in a uniform field.	Analysis	3
5	State Ampere's circuital law and explain any two applications of Ampere's Circuital law.	Understand	3
6	Derive the magnetic field intensity developed in a triangular closed circuit carrying current I in a uniform field.	Understand	3
7	Derive the magnetic field intensity developed in a circular loop carrying steady current I in a uniform field. Using Ampere circuital law derive the magnetic field intensity due to a co-axial cable carrying a steady current I	Understand	3
8	Derive the magnetic field intensity developed in a square loop carrying current I in a uniform field. Also State Lorentz force equation for a moving charge and explain its applications.	Understand	3
9	Derive the expression for coefficient of coupling in terms of mutual and self inductances	Understand	3
10	Derive the expression for curl H=J?	Understand	3

	Explain the concepts of scalar magnetic potential and vector magnetic potential? Find the maximum torque on an 85 turns rectangular coil with dimension (0.2x0.3) m carrying a current of 5 Amps in a field B = 6.5T	Understand	3
11	State and explain ampere circuital law	Analysis	4
12	Define magnetic induction, magnetic field ,magnetic flux density, magnetic field intensity, magnetic permeability and magnetic susceptibility.	Understand	4
13	State and explain Bio Savarts law, use the same to find an expression for the magnetic field intensity due to a long current carrying conductor.	Remember	3
14	Derive the expression for Maxwell's second and third equations.	Remember	3
15	Using Biot Savarts Law .Find H at any point on the axis of a circular current carrying coil.	Understand	3
	UNIT-IV **FORCE IN MAGNETIC FIELDS AND MAGNETIC POTENTIAL**		
1	A plane wave propagating through a medium with εr=8, μr=2 has E=0.5 sin (108t-βz) az v/m. Determine (i) β (ii) The loss tangent (iii) Wane impedance (iv) Wave velocity	Understand	4

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	(v) Magnetic field		
2	Discuss motion of charged particle in magnetic field.	Understand	4
3	Derive the expression for Lorentz force equation.	Understand	4
4	Derive the expression for force on a straight current carrying conductor placed in a magnetic field.	Understand	4
5	Derive the expression for the force between two current carrying conductors in the same direction.	Understand	4
6	Derive the expression for the torque on a current loop placed in a magnetic field.	Analyze	4
7	Define magnetic dipole? What is magnetic moment? Describe how a differential current loop behaves like a magnetic dipole.	Understand	4
8	Derive the expression for vector magnetic potential 'A' which satisfies the vector poisons equation.	Understand	4
9	Derive the expression for self-inductance of solenoid and torrid.	Analysis	4
10	Derive the expression for energy stored and energy density in a magnetic field.	Understand	4
11	Derive the general wave equations? And also discuss the wave motion in good conductors?	Remember	4
12	Analyze the wave behavior at boundaries under oblique incidence and derive the Brewster's angle. Also prove that a linearly polarized wave can be resolved into a right hand circularly polarized wave and a left hand circularly polarized wave of equal amplitude.	Remember	4

13	With reference to electromagnetic waves, explain the following a) Linear polarization b) Circular polarization c) Elliptical polarization and also derive the expression for standing wave. Find the location of nodes and antinodes in E and H fields.	Understand	4
14	Obtain the wave equation for conducting medium	Understand	4
15	Obtain the expression for the reflection by a perfect dielectric normal incidence	Analysis	4
16	From Maxwell's equation, derive the electromagnetic wave equation in conducting medium for E and H fields. And also explain different types of polarizations of uniform plane waves.	Understand	4
	UNIT-V **TIME VARYING FIELDS**		
1	Write and explain the Maxwell's equation in differential and integral forms for fields varying harmonically with time.	Understand	5
2	Derive Maxwell's four equations in point form and in differential form.	Understand	5
3	What is the physical significance of the pointing vector? And explain it in detail? Derive the expression for total power flow in coaxial cable?	Understand	5
4	Derive general field relations for time varying electric and magnetic fields using Maxwell's equation?	Understand	5
5	Explain faraday's law of Electromagnetic induction and derive the expression for induced E.M.F?	Analysis	5

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
6	Explain about induced E.M.F. and Derive the expressions for statically induced E.M.F and dynamically induced E.M.F	Understand	5
7	What do you mean by displacement currents? Write down the expression for the total current density?	Analysis	5
8	Explain briefly about the motional emf and derive an expression for it?	Understand	5
9	Discuss the pointing vector and pointing theorem? Also derive the ampere circuital law.	Understand	5
10	Define faradays laws. What are the different ways of emf generation? Explain with governing equation and suitable example for each? Also derive the differential and integral form of faradays law.	Understand	5
11	Define Brewster angle and derive its expression?	Understand	5
12	Derive the relationship between electric and magnetic fields?	Analysis	5
13	Explain complex, average and instantaneous poynting vector.	Understand	5
14	Derive the modified form of ampere circuital law in integral and differential forms.	Remember	5
15	Generate Ampere's law for time varying fields. Also list the Maxwell's equations in integral and point form for free space conditions.	Understand	5
16	Derive an expression for displacement current density J_d, and also give the physical interpretation of Maxwell's equation.	Analysis	5

ELECTRICAL MACHINES-I

PROGRAMME: B.Tech- EEE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **ELECTRICAL MACHINES-1**	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: Dr.V.TAMILSELVAN
COURSE CODE: **EE303ES** REGULATION:**R16**	COURSE TYPE: **core**
COURSE AREA/DOMAIN: EEE	CONTACT HOURS: 5 hours/Week.
CORRESPONDING LAB COURSE CODE : NA	LAB COURSE NAME: **ELECTRICAL MACHINES-1 lab**

BRIEF NOTE ON THE IMPORTANTANCE OF THE COURSE AND HOW IT FITS IN TO THE CURRICULAM

Electrical machines course is one of the important courses of the Electrical discipline. In this course the different types of DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.

PREREQUISITES, IF ANY

- Basic electrical & Electronics Engineering

MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
There shall be two mid tem examinations. Each Mid-term exam consists of subjective type and objective type test. The subjective test is for 10 marks, with duration of 1 hour	75	100

Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks. The student is assessed by giving two assignments, one, after completion of 1to 2 1/2 units and the second, after the completion of 2 1/2 to 5 units each carrying 5 marks. On the total the internal marks are 25. The average of two internal tests is the final internal marks. The external question paper is set by JNTUH consisting of part – A and part- B. Where part consists of short answer questions carrying total marks of 25 and part part-B consists of 5 essay type questions consists of internal choice each carrying 10 marks and the total of 50. The total external marks are 75.awarded considering the average of two assignments in each course		

EVALUATION SCHEME:

S.No	Component	Total Duration	Marks
1.	I Mid Examination	90 Minutes	20
2.	I Assignment	----	05
3.	II Mid Examination	90 Minutes	20
4.	II Assignment	------	05
5.	External Examination	3 hours	75

Course Objectives:

1. To study and understand different types of DC generators, their construction, operation and applications.
2. To study and understand different types Motors and Transformers, their construction, operation and applications.

3. To analyze performance aspects of various testing methods.

Course Outcomes:

1. Identify different parts of a DC machine & understand its operation
2. Carry out different testing methods to predetermine the efficiency of DC machines
3. Understand different excitation and starting methods of DC machines
4. Control the voltage and speed of a DC machines

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. EEE-I Sem	**L**	**T/P/D**	**C**
	4	1/-/-	**4**

EE303ES – ELECTRICAL MACHINES -1

UNIT – I D.C. Generators:

Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self excited generators – build-up of E.M.F – critical field resistance and critical speed – causes for failure to self excite and remedial measures. Load characteristics of shunt, series and compound generators

UNIT – II D.C Motors:

Principle of operation – Back E.M.F. – Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors – Armature voltage and field flux control methods. Motor starters (3 point and 4 point starters) Testing of D.C. machines – Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT – III Methods of Testing

Direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test – separation of stray losses in a d.c. motor test.

UNIT – IV Single phase transformers:

Types – constructional details-minimization of hysteresis and eddy current losses- EMF equation – operation on no load and on load – phasor diagrams Equivalent circuit – losses and efficiency – regulation – All day efficiency – effect of variations of frequency & supply voltage on iron losses.

UNIT – V OC and SC tests

Δ and openΔ/Δ/Y, Δ, Δ– Sumpner's test – predetermination of efficiency and regulation-separation of losses test-parallel operation with equal and unequal voltage ratios – auto transformers equivalent circuit – comparison with two winding transformers. Polyphase transformers – Polyphase connections – Y/Y, Y/

TEXT BOOKS:

1. "I.J. Nagrath & D.P. Kothari", "Electric Machines", Tata Mc Graw Hill Publishers, 3rd edition, 2004.
2. "P.S. Bimbra", "Electrical Machines", Khanna Publishers, 7th Edition, 2014.

REFERENCE BOOKS:

1. E. Clayton & N. M. Hancock "The Performance and Design Of Direct Current Machines" 3rd Edition Pitman, London 1959.
2. "A. E. Fritzgerald, C. Kingsley and S. Umans", "Electric Machinary", McGraw Hill Companies, 6th edition, 2003.
3. "Abhijith Chakrabarthi & SubithaDebnath", "Electrical Machines", Mc Graw Hill, 2015.

COURSE PLAN:

S.No	Unit No	Topic	No of sessions planned	Mode of teaching BB/PPT/OHP/MM	Reference *	Remarks
1.	I	Principle of operation – Action of commutator	1	BB	T1, T2	
2.		constructional features	1	BB	T1, T2	
3.		armature windings – lap and wave windings	1	PPT	T1, T2	
4.		armature windings – lap and wave windings	1	BB	T1, T2	
5.		E. M.F Equation,types of generator	1	BB	T1, T2	
6.		Armature reaction – Cross magnetizing	1	BB	T1, T2	
7.		de-magnetizing AT/pole	1	BB	T1, T2	
8.		compensating winding – commutation – reactance voltage	1	BB	T1, T2	
9.		methods of improving commutation	1	BB	T1, T2	
10.		OCC and load characteristics of DC generator	1	BB	T1, T2	
11.		causes for failure to self excite and remedial measures	1	BB	T1, T2	
12.		numerical problems	1	BB	T1, T2	
13.		numerical problems	1	BB	T1, T2	
14.		numerical problems	1	BB	T1, T2	
15.	II	D.C Motors: Principle of operation – Back E.M.F	1	PPT	T1, T2	

16.		Torque equation – characteristics and application of shunt, series and compound motors	1	BB	T1, T2	
17.		Armature reaction and commutation.	1	BB	T1, T2	
18.		Speed control of D.C. Motors - Armature voltage	1	BB	T1, T2	
19.		Speed control of D.C. Motors - field flux control method	1	BB	T1, T2	
20.		Motor starters-3 point	1	BB	T1, T2	
21.		Motor starters 4 point starter	1	BB	T1, T2	
22.		Testing of D.C. machines	1	BB	T1, T2	
23.		Losses – Constant & Variable losses	1	BB	T1, T2	
24.		calculation of efficiency – condition for maximum efficiency.	1	BB	T1, T2	
25.	III	Methods of Testing – direct	1	BB	T1, T2	
26.		Methods of Testing – indirect	1	BB	T1, T2	
27.		regenerative testing	1	BB	T1, T2	
28.		Brake test	1	PPT	T1, T2	
29.		Swinburne's test	1	BB	T1, T2	
30.		Hopkinson's test	1	BB	T1, T2	
31.		Field's test	1	BB	T1, T2	
32.		separation of stray losses in a d.c. motor test.	1	BB	T1, T2	
33.		numerical problems	1	BB	T1, T2	
34.		numerical problems	1	PPT	T1, T2	
35.	IV	Single phase transformer Types	1	BB	T1, T2	

36.		constructional details	1	BB	T1, T2	
37.		minimization of hysteresis and eddy current losses	1	BB	T1, T2	
38.		EMF equation	1	BB	T1, T2	
39.		Transformer on no-load and load condition	1	PPT	T1, T2	
40.		phasor diagrams	1	BB	T1, T2	
41.		Equivalent circuit	1	BB	T1, T2	
42.		losses and efficiency	1	BB	T1, T2	
43.		regulation - All day efficiency	1	BB	T1, T2	
44.		numerical problems	1	BB	T1, T2	
45.		numerical problems	1	BB	T1, T2	
46.	V	effect of variations of frequency & supply voltage on iron losses.	1	BB	T1, T2	
47.		OC and SC tests	1	BB	T1, T2	
48.		Sumpner's test	1	BB	T1, T2	
49.		predetermination of efficiency and regulation	1	BB	T1, T2	
50.		predetermination of efficiency and regulation	1	BB	T1, T2	
51.		separation of losses test	1	BB	T1, T2	
52.		numerical problems	1	BB	T1, T2	
53.		parallel operation with equal and unequal voltage ratios	1	BB	T1, T2	
54.		numerical problems	1	BB	T1, T2	
55.		auto transformer	1	PPT	T1, T2	

56.		Equivalent circuit	1	PPT	T1, T2	
57.		comparison with two winding transformers.	1	BB	T1, T2	
58.		Polyphase transformers -	1	BB	T1, T2	
59.		revision of previous question paper	1	PPT	T1, T2	
60.		revision of previous question paper	1	BB	T1, T2	

Text Books

1. "I.J. Nagrath & D.P. Kothari", "Electric Machines", Tata Mc Graw Hill Publishers, 3rd edition, 2004.
2. E. Clayton & N. M. Hancock "The Performance and Design Of Direct Current Machines" 3rd Edition Pitman, London 1959.

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Objective	Course Outcomes			
	a	**b**	**c**	**d**
I	S	H		
II	S		H	H
III			S	H

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Outcomes	Program Outcomes													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
a	S									S				
b	S					S							S	S
c	S		S					H						

d		S					S				S		H	S

UNIT-1

DC GENERATORS

MULTIPLE-CHOICE QUESTIONS

1. In D.C. generators, the cause of rapid brush wear may be

- (A) Severe sparking
- (B) Rough commutator surface
- (C) Imperfect contact
- **(D) Any of the above**

2. The insulating material used between the commutator segments is normally

- (A) Graphite
- (B) Paper
- **(C) Mica**
- (D) Insulating varnish

3. Eddy currents are induced in the pole shoes of a D.C. machine due to

- (A) Oscillating magnetic field
- (B) Pulsating magnetic flux
- **(C) Relative rotation between field and armature**
- (D) All above

4. Which of the following statement about D.C. generators is false?

- (A) Compensating winding in a D.C. machine helps in commutation

- (B) In a D. C. generator interpoles winding is connected in series with the armature winding
- (C) Back pitch and front pitch are both odd and approximately equal to the pole pitch
- **(D) Equalizing bus bars are used with parallel running of D.C. shunt generators**

5. In a D.C. generator the ripples in the direct e.m.f. generated are reduced by

- (A) Using conductor of annealed copper
- (B) Using commutator with large number of segments
- **(C) Using carbon brushes of superior quality**
- (D) Using equalizer rings

6. Satisfactory commutation of D.C. machines requires

- (A) Brushes should be of proper grade and size
- (B) Brushes should smoothly run in the holders
- (C) Smooth, concentric commutator properly undercut
- **(D) All of the above**

7. In a D.C. generator the number of mechanical degrees and electrical degrees will be the same when

- (A) r.p.m. is more than 300
- (B) r.p.m. is less than 300
- (C) Number of poles is 4
- **(D) Number of poles is 2**

8. In D.C. generators on no-load, the air gap flux distribution in space is

- (A) Sinusoidal
- (B) Triangular
- (C) Pulsating

- **(D) Flat topped**

9. Flashing the field of D.C. generator means

- (A) Neutralizing residual magnetism
- **(B) Creating residual magnetism by a D.C. source**
- (C) Making the magnetic losses of forces parallel
- (D) Increasing flux density by adding extra turns of windings on poles

10. The following constitute short-circuit in the armature winding.

- (A) Insulation failure between two commutator bars
- (B) Insulation failure between two turns of a coil
- **(C) Two of more turns of the same coil getting grounded**
- (D) All of the above

11. In a D.C. machine stray loss is the sum of

- (A) Total copper loss and mechanical loss
- (B) Armature copper loss and iron loss
- (C) Shunt field copper loss and mechanical loss
- **(D) Iron loss and mechanical loss**

12. Which of the following generator will have negligible terminal voltage while running on no-load?

- **(A) Series generator**
- (B) Shunt generator
- (C) Compound generator
- (D) Separately excited generator

13. In a separately excited generator supplying rated load the armature reaction:

- **(A) Is always present**
- (B) Is always absent
- (C) May be sometimes present
- (D) None of the above

14. When two D.C. series generators are running in parallel, an equalizer bar is used

- (A) To increase the speed and hence generated e.m.f.
- (B) To increase the series flux
- **(C) So that two similar machines will pass approximately equal currents to the load**
- (D) To reduce the combined effect of armature reaction of both machines

15. A D.C. generator works on the principle of

- (A) Lenz's law
- (B) Ohm's law
- **(C) Faraday's law of electromagnetic induction**
- (D) None of the above

16. Two D.C. shunt generators, each with armature resistance of 0.02 ohm and field resistance of 50 ohm run in parallel and supply a total current of 1000 amperes to the load circuit. If their e.m.fs. are 270 V and 265 V, their bus bar voltage will be

- (A) 270 V
- **(B) 267.5 V**
- (C) 265 V
- (D) 257.4 V

17. In a D.C. generator the critical resistance can be increased by

- (A) Increasing its field resistance
- (B) Decreasing its field resistance

- **(C) Increasing its speed**
- (D) Decreasing its speed

18. For both lap and wave windings, there are as many commutator bars as the number of

- (A) Slots
- (B) Armature conductors
- **(C) Winding elements**
- (D) Poles

19. In case of D.C. machine winding, number of commutator segments is equal to

- **(A) Number of armature coils**
- (B) Number of armature coil sides
- (C) Number of armature conductors
- (D) Number of armature turns

20. A D.C. welding generator has

- **(A) Lap winding**
- (B) Wave moving
- (C) Duplex winding
- (D) Any of the above

21. A separately excited generator as compared to a self-excited generator

- (A) Is amenable to better voltage control
- (B) Is more stable
- (C) Has exciting current independent of load current
- **(D) Has all above features**

22. In D.C. generators, the brushes on commutator remain in contact with conductors which

- (A) Lie under South Pole
- (B) Lie under North Pole
- **(C) Lie under interpolar region**
- (D) Are farthest from the poles

23. For a D.C. machines laboratory following type of D.C. supply will be suitable

- (A) Rotary converter
- (B) Mercury are rectifier
- **(C) Induction motor D.C. generator set**
- (D) Synchronous motor D.C. generator set

24. Compensating windings are used in D.C. generators

- (A) Mainly to reduce the eddy currents by providing local short-circuits
- (B) To provide path for the circulation of cooling air
- **(C) To neutralize the cross-magnetizing effect of the armature reaction**
- (D) None of the above

25. Open circuited armature coil of a D.C. machine is

- (A) Identified by the scarring of the commutator segment to which open circuited coil is connected
- (B) Indicated by a spark completely around the commutator

- **(C) Both (A) and (B)**
- (D) None of the above

26. Inter-pole flux should be sufficient to

- (A) Neutralize the commutating self induced e.m.f.
- (B) Neutralize the armature reaction flux
- **(C) Neutralize both the armature reaction flux as well as commutating e.m.f. induced in the coil**
- (D) Perform none of the above functions

27. In a D.C. generator the magnetic neutral axis coincides with the geometrical neutral axis, when

- **(A) There is no load on the generator**
- (B) The generator runs on full load
- (C) The generator runs on overload
- (D) The generator runs on designed speed

28. In a D.C. generator the critical resistance refers to the resistance of

- (A) Brushes
- **(B) Field**
- (C) Armature
- (D) Load

29. Lap winding is composed of

- **(A) Any even number of conductors**
- (B) Any odd number of conductors
- (C) That even number which is exact multiple of poles + 2
- (D) That even number which is exact multiple of poles

30. In a D.C. generator

- (A) External resistance = internal characteristic armature reaction
- (B) Internal characteristic = magnetization characteristic ohmic drop
- **(C) External characteristic = magnetization characteristic ohmic drop armature reaction**
- (D) Magnetization characteristic = external characteristic

DC Motors Objective Questions

1. A three point starter is considered suitable for

- (A) Shunt motors
- (B) Shunt as well as compound motors
- (C) Shunt, compound and series motors
- (D) All D.C. motors

2. Which D.C. motor has got maximum self loading property?

- (A) Series motor
- (B) Shunt motor
- (C) Cumulatively compounded motor
- (D) Differentially compounded motor

3. Sparking at the commutator of a D.C. motor may result in

- (A) Damage to commutator segments
- (B) Damage to commutator insulation
- (C) Increased power consumption
- (D) All of the above

4. Following motor is used where high starting torque and wide speed range control is required.

- (A) Single phase capacitor start
- (B) Induction motor

- (C) Synchronous motor
- (D) D.C. motor

5. The armature voltage control of D.C. motor provides

- (A) Constant torque drive
- (B) Constant voltage drive
- (C) Constant current drive
- (D) None of the above

6. Which one of the following is not necessarily the advantage of D.C. motors over A.C. motors?

- (A) Low cost
- (B) Wide speed range
- (C) Stability
- (D) High starting torque

7. If a D.C. motor designed for 40°C ambient temperature is to be used for 50°C ambient temperature, then the motor

- (A) Of lower H.P. should be selected
- (B) Of higher H.P. should be selected
- (C) Can be used for 50°C ambient temperature also
- (D) Is to be de-rated by a factor recommended by manufacturer and select the next higher H.P. motor

8. Which motor should not be started on no-load?

- (A) Series motor
- (B) Shunt motor
- (C) Cumulatively compounded motor
- (D) Differentially compounded motor

9. The losses occurring in a D.C. generator are given below. Which loss is likely to have highest proportion at rated load of the generator?

- (A) Hysteresis loss
- (B) Field copper loss
- (C) Armature copper loss
- (D) Eddy current loss

10. Which of the following losses are significantly reduced by laminating the core of a D.C. generator?

- (A) Hysteresis losses
- (B) Eddy current losses
- (C) Copper losses
- (D) Windage losses

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01. Answer: Option B 02. Answer: Option D 03. Answer: Option D 04. Answer: Option D 05. Answer: Option A 06. Answer: Option A 07. Answer: Option D 08. Answer: Option A 09. Answer: Option C 10. Answer: Option B

11. For which types of D.C. motor, dynamic braking is generally used?

- (A) Shunt motors

- (B) Series motors
- (C) Compound motors
- (D) All of the above

12. D.C. motor is to a drive a load which is almost nil for certain part of the load cycle and peak value for short duration. We will select this

- (A) Series motor
- (B) Shunt motor
- (C) Compound motor
- (D) Any of the above

13. One D.C. motor drives another D.C. motor. The second D.C. motor when excited and driven

- (A) Runs as a generator
- (B) Does not run as a generator
- (C) Also runs as a motor comes to stop after sometime
- (D) None of these

14. The direction of rotation of a D.C. series motor can be changed by

- (A) Interchanging supply terminals
- (B) Interchanging field terminals
- (C) Either of (A) and (B) above
- (D) None of the above

15. A D.C. series motor is that which

- (A) Has its field winding consisting of thick wire and less turns
- (B) Has a poor torque
- (C) Can be started easily without load
- (D) Has almost constant speed

16. What will happen if the back e.m.f. of a D.C. motor vanishes suddenly?

- (A) The motor will stop
- (B) The motor will continue to run
- (C) The armature may burn
- (D) The motor will run noisy

17. Which of the following load normally needs starting torque more than the rated torque?

- (A) Blowers
- (B) Conveyors
- (C) Air compressors
- (D) Centrifugal pumps

18. Which one of the following is not the function of pole shoes in a D.C. machine?

- (A) To reduce eddy current loss
- (B) To support the field coils
- (C) To spread out flux for better uniformity

- (D) To reduce the reluctance of the magnetic path

19. Speed control by Ward Leonard method gives uniform speed variation

- (A) In one direction
- (B) In both directions
- (C) Below normal speed only
- (D) Above normal speed only

20. As there is no back e.m.f. at the instant of starting a D.C. motor, in order to prevent a heavy current from flowing though the armature circuit

- (A) A resistance is connected in series with armature
- (B) A resistance is connected parallel to the armature
- (C) Armature is temporarily open circuited
- (D) A high value resistor is connected across the field winding

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01. Answer: Option D 02. Answer: Option C 03. Answer: Option A 04. Answer: Option B 05. Answer: Option A 06. Answer: Option C 07. Answer: Option B 08. Answer: Option A 09. Answer: Option B 10. Answer: Option A

21. If the speed of a D.C. shunt motor is increased, the back e.m.f. of the motor will

- (A) Increase
- (B) Decrease
- (C) Remain same
- (D) Become zero

22. Torque developed by a D.C. motor depends upon

- (A) Magnetic field
- (B) Active length of the conductor
- (C) Current flow through the conductors
- (D) All above factors

23. D.C. generators are installed near the load centers to reduce

- (A) Iron losses
- (B) Line losses
- (C) Sparking
- (D) Corona losses

24. Where D.C. motor of H.P. 12 or more requires frequent starting, stopping, reversing and speed control

- (A) Drum type controller is used
- (B) Three point starter is used
- (C) Four point starter is used
- (D) All above can be used

25. If the supply voltage for a D.C. motor is increased, which of the following will decrease?

- (A) Starting torque
- (B) Operating speed
- (C) Full-load current
- (D) All of the above

26. No-load speed of which of the following motor will be highest?

- (A) Shunt motor
- (B) Series motor
- (C) Cumulative compound motor
- (D) Differentiate compound motor

27. For starting a D.C. motor a starter is required because

- (A) It limits the speed of the motor
- (B) It limits the starting current to a safe value
- (C) It starts the motor
- (D) None of the above

28. In a D.C. shunt motor, under the conditions of maximum power, the current in the armature will be

- (A) Almost negligible
- (B) Rated full-load current
- (C) Less than full-load current
- (D) More than full-load current

29. The starting resistance of a D.C. motor is generally

- (A) Low
- (B) Around 500 Q
- (C) 1000 Q

(D) Infinitely large

30. The condition for maximum power in case of D.C. motor is

(A) Back e.m.f. = 2 × supply voltage

(B) Back e.m.f. = I × supply voltage

(C) Supply voltage =I × back e.m.f.

(D) Supply voltage = back e.m.f.

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01. Answer: Option A 02. Answer: Option D 03. Answer: Option B 04. Answer: Option A 05. Answer: Option C 06. Answer: Option B 07. Answer: Option B 08. Answer: Option D 09. Answer: Option A 10. Answer: Option B

Transformer

1. A transformer cannot raise or lower the voltage of a D.C. supply because

(A) There is no need to change the D.C. voltage

(B) A D.C. circuit has more losses

(C) Faraday's laws of electromagnetic induction are not valid since the rate of change of flux is zero

(D) None of the above

2. The primary coil of a transformer is connected to a 60 V ac source. The secondary coil is connected to a 330 Ω load. The turns ratio is 3:1. What is the secondary voltage?

(A) 2 V

(B) 20 V

- (C) 180 V
- (D) 18 V

3. In a certain transformer, the input power to the primary is 120 W. If 8.5 W are lost to the winding resistance, what is the output power to the load, neglecting any other issues?

- (A) 0 W
- (B) 14.1 W
- (C) 111.5 W
- (D) 1,020 W

4. While conducting short-circuit test on a transformer the following side is short circuited

- (A) High voltage side
- (B) Low voltage side
- (C) Primary side
- (D) Secondary side

5. In the transformer the function of a conservator is to

- (A) Provide fresh air for cooling the transformer
- (B) Supply cooling oil to transformer in time of need
- (C) Protect the transformer from damage when oil expends due to heating
- (D) None of the above

6. The purpose of providing iron core in a step-up transformer is

- (A) To provide coupling between primary and secondary
- (B) To increase the magnitude of mutual flux
- (C) To decrease the magnitude of magnetizing current
- (D) To provide all above features

7. A transformer has a 1:6 turns ratio and a secondary coil load resistance of 470 Ω. The load resistance as seen by the source is

- (A) 1.3 Ω
- (B) 7.8 Ω
- (C) 78 Ω
- (D) 13 Ω

8. The noise resulting from vibrations of laminations set by magnetic forces, is termed as

- (A) Magnetostriction
- (B) Boo
- (C) Hum
- (D) Zoom

9. Distribution transformers are generally designed for maximum efficiency around

- (A) 90% load
- (B) Zero load
- (C) 25% load

- (D) 50% load

10. Which of the following is not a routine test on transformers?

- (A) Core insulation voltage test
- (B) Impedance test
- (C) Radio interference test
- (D) Polarity test

---

01. Answer: Option C 02. Answer: Option B 03. Answer: Option C 04. Answer: Option B 05. Answer: Option C 06. Answer: Option C 07. Answer: Option D 08. Answer: Option C 09. Answer: Option D 10. Answer: Option C

11. Which of the following properties is not necessarily desirable for the material for transformer core?

- (A) Low hysteresis loss
- (B) High permeability
- (C) High thermal conductivity
- (D) Adequate mechanical strength

12. Gas is usually not liberated due to dissociation of transformer oil unless the oil temperature exceeds

- (A) 50°C
- (B) 80°C
- (C) 100°C

- (D) 150°C

13. Material used for construction of transformer core is usually

- (A) Wood
- (B) Copper
- (C) Aluminium
- (D) Silicon steel

14. A transformer

- (A) Changes ac to dc
- (B) Changes dc to ac
- (C) Steps up or down dc voltages
- (D) Steps up or down ac voltages

15. The mutual inductance when k = 0.65, L_1 = 2 μH, and L_2 = 5 μH is

- (A) 2 mH
- (B) 2 μH
- (C) 4 μH
- (D) 8 μH

16. What kVA rating is required for a transformer that must handle a maximum load current of 8 A with a secondary voltage of 2 kV?

- (A) 4 kVA
- (B) 0.25 kVA
- (C) 16 kVA
- (D) 8 kVA

17. If the percentage impedances of the two transformers working in parallel are different, then

- (A) Transformers will be overheated
- (B) Power factors of both the transformers will be same
- (C) Parallel operation will be not possible
- (D) Parallel operation will still be possible, but the power factors at which the two transformers operate will be different from the power factor of the common load

18. A transformer consists of two or more cores that are electrically coupled on a common core.

- (A) True
- (B) False

19. If the voltage is stepped up, the current is stepped down, and vice versa.

- (A) True
- (B) False

20. A transformer oil must be free from

- (A) Sludge
- (B) Odour
- (C) Gases
- (D) Moisture

View All Answers

01. Answer: Option C 02. Answer: Option D 03. Answer: Option D 04. Answer: Option D 05. Answer: Option B 06. Answer: Option C 07. Answer: Option D 08. Answer: Option B 09. Answer: Option A 10. Answer: Option D

21. Which of the following is the main advantage of an autotransformer over a two winding transformer?

- (A) Hysteresis losses are reduced
- (B) Saving in winding material
- (C) Copper losses are negligible
- (D) Eddy losses are totally eliminated

22. Helical coils can be used on

- (A) Low voltage side of high kVA transformers
- (B) High frequency transformers
- (C) High voltage side of small capacity transformers
- (D) High voltage side of high kVA rating transformers

23. A transformer with a 110 V primary has a 15:1 turns ratio. The load resistance, R_L, is 120 Ω. What is the approximate voltage across the load?

- (A) 7.3 V
- (B) 73 V
- (C) 88 V
- (D) 880 V

24. A transformer changes ac to dc.

- (A) True
- (B) False

25. When a 200 Ω load resistor is connected across the secondary winding of a transformer with a turns ratio of 4, the source "sees" a reflective load of

- (A) 50 Ω
- (B) 12.5 Ω
- (C) 800 Ω
- (D) 0 Ω

26. If the supply frequency to the transformer is increased, the iron loss will

- (A) Not change
- (B) Decrease
- (C) Increase
- (D) Any of the above

27. Short circuit test on transformers is conducted to determine

- (A) Hysteresis losses
- (B) Copper losses
- (C) Core losses
- (D) Eddy current losses

28. The primary is the winding connected to the source, and the secondary is the winding connected to the load.

- (A) True
- (B) False

29. What is the coefficient of coupling for a transformer in which 4% of the total flux generated in the primary does not pass through the secondary?

- (A) 0.4
- (B) 4
- (C) 9.6
- (D) 0.96

30. Natural air coo ling is generally restricted for transformers up to

- (A) 1.5 MVA
- (B) 5 MVA
- (C) 15 MVA
- (D) 50 MVA

View All Answers

01. Answer: Option B 02. Answer: Option A 03. Answer: Option A 04. Answer: Option B 05. Answer: Option B 06. Answer: Option C 07. Answer: Option B 08. Answer: Option A 09. Answer: Option D 10. Answer: Option A

1. In a power or distribution transformer about 10 per cent end turns are heavily insulated

- (A) To withstand the high voltage drop due to line surge produced by the shunting capacitance of the end turns
- (B) To absorb the line surge voltage and save the winding of transformer from damage
- (C) To reflect the line surge and save the winding of a transformer from damage
- (D) None of the above

2. The turns ratio required to match an 80 Ω source to a 320 Ω load is

- (A) 80
- (B) 20
- (C) 4
- (D) 2

3. A good voltage regulation of a transformer means

- (A) Output voltage fluctuation from no load to full load is least
- (B) Output voltage fluctuation with power factor is least
- (C) Difference between primary and secondary voltage is least
- (D) Difference between primary and secondary voltage is maximum

4. Which of the following loss in a transformer is zero even at full load?

- (A) Core loss
- (B) Friction loss
- (C) Eddy current loss
- (D) Hysteresis loss

5. A no-load test is performed on a transformer to determine

- (A) Core loss
- (B) Copper loss
- (C) Efficiency
- (D) Magnetizing current and loss

6. In a certain loaded transformer, the secondary voltage is one-fourth the primary voltage. The secondary current is

- (A) One-fourth the primary current
- (B) Four times the primary current
- (C) Equal to the primary current
- (D) One-fourth the primary current and equal to the primary current

7. A step-down transformer has a turn's ratio less than 1.

- (A) True
- (B) False

8. A center tap (CT) is a connection at the midpoint of the secondary winding of a transformer.

- (A) True
- (B) False

9. The efficiencies of transformers compared with that of electric motors of the same power are

- (A) About the same
- (B) Much smaller
- (C) Much higher
- (D) Somewhat smaller

10. Primary winding of a transformer

- (A) Is always a low voltage winding
- (B) Is always a high voltage winding
- (C) Could either be a low voltage or high voltage winding
- (D) None of the above

View All Answers

01. Answer: Option A 02. Answer: Option D 03. Answer: Option A 04. Answer: Option B 05. Answer: Option D 06. Answer: Option B 07. Answer: Option A 08. Answer: Option A 09. Answer: Option C 10. Answer: Option C

This set of Transformers Problems focuses on “OC Test on Transformer”.

1. During open circuit test (OC) of a transformer _____
a) primary is supplied rated kVA
b) primary is supplied full-load current
c) primary is supplied current at reduced voltage
d) primary is supplied rated voltage
View Answer

Answer: d
Explanation: Open circuit test is normally conducted on rated voltage because any machine is constructed to give maximum efficiency near rated value. Hence, it is operated at rated voltage, and we have to perform the test on machine is to be used.

2. Open circuit test on transformers is conducted so as to get _____
a) Hysteresis losses
b) Copper losses
c) Core losses
d) Eddy current losses
View Answer

Answer: c
Explanation: Open circuit test gives the core losses also called as iron losses and shunt parameters of the equivalent circuit of transformer. Open circuit test and short circuit test both provide all the parameters of equivalent circuit.

3. Why OC test is performed on LV side?
a) Simple construction
b) Less voltage is required and parameters can be transformed to HV side
c) It’ll not give losses ig conducted on HV side
d) HV side does not have connections for voltage
View Answer

Answer: b
Explanation: Open circuit test can be performed on any side but for our convenience and supply voltage available we generally conduct the test on LV side, to get corresponding parameters on HV side we can use transformation ratio.

4. In OC test all the power supplied is utilised for _____
a) Core losses
b) Iron losses
c) Windage losses
d) Cannot be determined
View Answer

Answer: b
Explanation: In open circuit test all the power supplied is used to overcome iron losses and hence, by taking the reading of input power one can easily do the calculations to find shunt parameters of equivalent circuit of transformer.

5. How shunt branch component Gi is calculated?
a) $Po/v1^2$
b) V1/Io
c) Io/ V^2
d) Any of the above
View Answer

Answer:
Explanation: Shunt branch resistance inverse is denoted by Gi. This Gi can be calculated by the power drop taking place in the resistance divided by square of the voltage applied across the resistor. Current by voltage will give net admittance.

6. Which of the following statements is/are correct statements?
a) EMF per turn in LV winding is more than EMF per turn in LV winding
b) EMF per turn in LV winding is less than EMF per turn in LV winding
c) EMF per turn in HV winding is equal to EMF per turn in LV winding
d) Can’t comment
View Answer

Answer: c
Explanation: In a transformer, primary volt-ampere is equal to secondary volt-ampere and primary ampere turns are also equal to secondary ampere turns So, EMF per turn in both the winding are equal. Total induced emf on both sides depends on the number of turns, flux and frequency.

7. If the applied voltage of a transformer is increased by 50% and the frequency is reduced by 50%, the maximum flux density will _____
a) Changes to three times the original value
b) Changes to 1.5 times the original value
c) Changes to 0.5 times the original value
d) Remains the same as the original value
View Answer

Answer: a
Explanation: Magnetic flux density α β/A. Magnetic flux φ α V/f. φ2/ φ1 = V2/V1 * f1/f2. Since voltage is increased by 50%, V2 thus becomes 1.5 times V1 and frequency becomes 0.5 times the original frequency. Thus, maximum flux density changes to 3 times the original value.

8. The total core loss can be termed as _____
a) Eddy current loss
b) Hysteresis loss

c) Copper loss
d) Magnetic loss
View Answer

9. 2 KVA, 230 V, 50 Hz single phase transformer has an eddy current loss of 40 watts. The eddy current loss when the transformer is excited by a dc source of same voltage will be _____
a) Equal to 40W
b) Less than 40W
c) More than 40W
d) Zero watts
View Answer

Answer: d
Explanation: Eddy current loss is directly proportional to the frequency^2. So, for DC current frequency is equal to 0 Hz. Thus, eddy current losses being directly proportional to square of frequency they'll be equal to 0.

10. Which of the following is the correct formula for Bm?
a) Bm= $(Yo2-Gi2)^{(1/2)}$
b) Bm= $(Yo2+Gi2)^{(1/2)}$
c) Bm= $(Yo2-Gi2)^{(2)}$
d) Bm= $(Yo2+Gi2)^{(1/2)}$
View Answer

Answer: a
Explanation: We get the value of Y0 from the no-load current and voltage reading as, Io/V1. Similalry we get the value of Gi from output power and voltage reading as, Po/V1. It then follows that, Bm= (Yo2-Gi2)(0.5).

11. How shunt branch component Y0 is calculated?
a) I0/V1
b) V1/I0
c) $P0/V1^2$
d) Cannot be determined
View Answer

Answer: a
Explanation: Shunt branch admittance is defined as inverse of shunt branch impedance. As we know, impedance can be calculated by the simple ohm's law; admittance is equal to the inverse of the impedance.

This set of Transformers Multiple Choice Questions & Answers (MCQs) focuses on “SC Test on Transformer”.

1. While conducting short-circuit test on a transformer which side is short circuited?

a) High voltage side

b) Low voltage side

c) Primary side

d) Secondary side

View Answer

Answer: b

Explanation: It’s a common practice to conduct SC test from HV side, while keeping LV side short circuited. Thus, short circuited current is made to flow from shorted low voltage terminals i.e. LV side.

2. During short circuit test why iron losses are negligible?

a) The current on secondary side is negligible

b) The voltage on secondary side does not vary

c) The voltage applied on primary side is low

d) Full-load current is not supplied to the transformer

View Answer

Answer: c

Explanation: Very small amount of voltage is given to the transformer primary thus the magnetic losses which are dependent on magnetic flux density will get minimum value, hence iron losses are negligible.

3. Short circuit test on transformers is conducted to determine _____

a) Core losses

b) Copper losses

c) Hysteresis losses

d) Eddy current losses

View Answer

Answer: b

Explanation: Short circuit test is used to determine the copper losses taking place in the transformer under operation, while open circuit test gives us the value of core losses taking place in the transformer.

4. When a short circuit test on a transformer is performed at 25 V, 50 Hz, the drawn current is I1. If the test is performed by 25 V and 25 Hz and power drawn current is I2, then

a) I1 > I2

b) I1 < I2

c) I1 = I2

d) Can't be defined

View Answer

Answer: b

Explanation: Current by ohm's law is equal to voltage divided by impedance. So, I=V/Z. Here Z is inductive load, thus Z= 2πfL. So as the frequency decreases the impedance also decreases and ultimately it reduces the denominator term causing increase in current.

5. Why SC test is not conducted on LV side?

a) Difficult to arrange low voltage supply

b) Difficult to arrange high current supply

c) Difficult to arrange low voltage and high current supply to the LV

d) SC test on LV does not give correct results

View Answer

Answer: c

Explanation: If rated voltages and power is considered we need only 5% of rated voltage to be applied at on HV side, while by calculations current requirement is also less. For the same test on LV side though voltage required is less compare to HV side, current required is very high.

6. SC test gives _____

a) Series parameters of equivalent circuit

b) Parallel parameters of equivalent circuit

c) Both parameters of equivalent circuit

d) Neither series nor parallel parameter of equivalent circuit

View Answer

Answer: a

Explanation: Short circuit test gives the copper losses; these losses are taken into consideration by series parameters of the equivalent circuit. While, Open circuit test gives us iron losses; which are shown by parallel components of equivalent circuit.

7. For 200 kVA, 440/6600-V transformer, short circuit test on the LV side would require _____

a) 22V

b) 330V

c) 44V

d) Can’t be calculated

View Answer

Answer: a

Explanation: For a given transformer SC test is conducted on LV side, thus we’ll use 5% of rated voltage on the low voltage side. Hence, 5% of 440V calculation gives the value of 440*5/100= 22V on LV side.

8. For a transformer given of 100 kVA, 220/6000-V transformer, short circuit test is performed. What current rating is needed?

a) 30A

b) 445A

c) 60A

d) Can’t be calculated

View Answer

Answer: b

Explanation: For a given transformer here, test is performed on low voltage side, thus we need the value of current on the low voltage side, by dividing the reactive power by the rated voltage value, i.e. 200*1000/100= 445A.

9. What will be the value of voltage and current for a given transformer of 10 MVA, 220/4400-V which we are about to perform the Short circuit test?

a) 220 V, 30 A

b) 220 V, 2.27A

c) 440 V, 30 A

d) 440 V, 2.27 A

View Answer

Answer: b

Explanation: Since short circuit test is always done on the HV side unless mentioned specifically, thus values are calculated with HV side parameters. Voltage required on HV side = 4400*5/100 = 220 V and 10*1000/4400= 2.27A.

10. We only get copper losses from the short circuit test.

a) True

b) False

View Answer

11. With the help of short circuit calculations we get value of _____

a) Individual resistance and inductance of both sides

b) Resistance and inductance of primary side

c) Resistance and inductance of primary side

d) Combined resistance and inductance of both sides

View Answer

Answer: d

Explanation: Short calculations include the ratio of short circuited voltage to the short-circuited current which gives Z value, similarly the R value is calculated by dividing the Short-circuited power with short circuited current square. Then, X is calculated for whole circuit.

12. Short circuit test is performed on a transformer with a certain impressed voltage at rated frequency. What will happen if the short circuit test is now performed with the same magnitude of impressed voltage, but at frequency higher than the rated frequency?

a) The magnitude of current will increase, but power factor will decrease

b) The magnitude of current will decrease, but power factor will increase

c) The magnitude of current will increase, power factor will increase

d) The magnitude of current will decrease, power factor will decrease

View Answer

Answer: d

Explanation: Since frequency has been increased, the leakage reactance will increase. Which will increase the impedance. Thus, current will be less due to inverse proportionality and power factor will be poorer.

This set of Transformers Multiple Choice Questions & Answers (MCQs) focuses on “Sumpner’s Test”.

1. Sumpner’s test is conducted on transformers to study effect of _____

a) Temperature

b) Stray losses

c) All-day efficiency

d) Cannot be determined

View Answer

Answer: a

Explanation: Sumpner's test is the test which is used to determine the steady temperature rise if the transformer was fully loaded continuously; this is so because under each of these tests the power loss to which the transformer is subjected is either the core-loss or copper-loss but not both.

2. Which of the following tests are enough to find all the parameters related to a transformer?

a) OC test

b) OC, SC test

c) OC, SC, Sumpner's test

d) Sumpner's test

View Answer

Answer: c

Explanation: While OC and SC tests on a transformer yield its equivalent circuit parameters, these cannot be used for the 'heat run' test wherein the purpose is to determine the steady temperature rise if the transformer was fully loaded continuously.

3. Sumpner's test is performed on _____

a) Single transformer at a time

b) Only two transformers at a time

c) Minimum 2 transformers at a time

d) Many transformers at a time

View Answer

Answer: b

Explanation: Sumpner's test is used to determine the effect of transformer on loaded condition. Thus, two transformers are tested simultaneously, where one simply acts as a load to another transformer.

4. In Sumpner's test _____

a) Primaries can be connected in either way

b) Primaries are connected in parallel with each other

c) Primaries of both transformers are connected in series with each other

d) No need to connect primaries

View Answer

Answer: b

Explanation: Sumpner's test is also called as back-to-back test, where two transformers are used where one transformer acts as a load to another transformer. Primaries of both of the transformers used in a test, are connected in parallel with each other.

5. Which test is sufficient for efficiency of two identical transformers under load conditions?

a) Short-circuit test

b) Back-to-back test

c) Open circuit test

d) Any of the above

View Answer

Answer: b

Explanation: Open circuit test and short circuit test collectively gives the value of all parameters of an equivalent circuit of a transformer. While Sumpner's back-to-back test gives the heat run effect of machine by considering rise in temperature.

6. In Sumpner's test _____

a) Two secondaries are connected in phase opposition

b) Two secondaries are connected in phase addition

c) Can be connected in either way

d) Never connected with each other

View Answer

Answer: a

Explanation: In conducting Sumpner's test two primaries are connected in parallel to the rated voltage supply and secondaries are connected in phase opposition. For the secondaries to be in phase opposition rated secondary voltage across the terminals to be zero.

7. When secondaries are connected in phase opposition, power drawn by the circuit is equal to _____

a) 2*Pi

b) Pi2

c) Pi

d) 2*Pc

View Answer

Answer: a

Explanation: If V2 source is assumed shorted, the two transformers appear in open circuit to source V1 as their secondaries are in phase opposition and therefore no current can flow in them. The current drawn from source V1 is thus 2I0 and power is 2P0 = 2Pi, twice the core-loss of each transformer.

8.When the AC supply at the primary side of a transformer are shorted, power drawn by the circuit is equal to _____

a) 2*PC

b) 2*Pi

c) 2*PC + 2*Pi

d) Can't be determined

View Answer

Answer: a

Explanation: When the ac supply (10) terminals are shorted, the transformers are series-connected across V2 supply and are short-circuited on the side of primaries. Therefore, the impedance seen at V2 is 2Z and when V2 is adjusted to circulate full-load current (Ifl), the power fed in is 2PC (twice the full-load copper-loss of each transformer).

9.Total power required for Sumpner's test is given by _____

a) PC + Pi

b) PC + 2Pi

c) 2PC + Pi

d) 2(PC + Pi)

View Answer

Answer: d

Explanation: In the Sumpner's test while the transformers are not supplying any load, full iron-loss occurs in their cores and full copper-loss occurs in their windings; net power input to the transformers being (2P0 + 2Pc). The heat run test could, therefore, be conducted on the two transformers, while only losses are supplied.

This set of Transformers Assessment Questions and Answers focuses on "Efficiency".

1. When will be the efficiency of a transformer maximum?

a) Copper losses = hysteresis losses

b) Hysteresis losses = eddy current losses

c) Eddy current losses = copper losses

d) Copper losses = iron losses

View Answer

Answer: d

Explanation: When the variable copper losses of a transformer becomes equal to the fixed iron losses of a transformer then we will get maximum efficiency. From these losses we'll get the value of current required.

2. Efficiency of a power transformer is near to the _____

a) 100 per cent

b) 98 per cent

c) 50 per cent

d) 25 per cent

View Answer

Answer: b

Explanation: The efficiency of the transformer obtained from various experiments conducted on various loads showed the efficiency greater than 90% always. Transformer thus, can be said highly efficient device.

3. On which factors transformer routine efficiency depends upon?

a) Supply frequency

b) Load current

c) Power factor of load

d) Load current and power factor of load

View Answer

Answer: d

Explanation: Efficiency of the transformer can be calculated by the output power divided by input power. Both of these powers include power factor in their calculations while load current and load voltage is also required in calculations.

4. Normal transformers are designed to have maximum efficiency at _____

a) Nearly full load

b) 70% full load

c) 50% full load

d) No load

View Answer

Answer: a

Explanation: Every device is manufactured to get maximum efficiency at the rated loads, i.e. full load. Thus, transformer will give the maximum efficiency at nearly full load. Internal losses are so adjusted to get maximum efficiency.

5. At which load condition maximum efficiency of a distribution transformer will be achieved?

a) At no load

b) At 60% full load

c) At 80% full load

d) At full load

View Answer

Answer: b

Explanation: The main difference between power transformer and distribution transformer is distribution transformer is designed for maximum efficiency at 60% to 70% load as these transformers normally doesn't operate at full load all the time.

6. Power transformers other than distribution transformers are generally designed to have maximum efficiency around _____

a) No-load

b) Half-load

c) Near full-load

d) 10% overload

View Answer

Answer: c

Explanation: Similar to normal transformers power transformers are also designed to get maximum efficiency at load which is near to the full load of a transformer specified. Only in the case distribution transformer maximum efficiency is achieved at 60% of full load.

7. For a transformer given, operating at constant load current, maximum efficiency will occur at _____

a) 0.8 leading power factor

b) 0.8 lagging power factor

c) Zero power factor

d) Unity power factor

View Answer

Answer: d

Explanation: Maximum efficiency for a transformer will be achieved at full load. While in the case of power factor also every device is set to get maximum efficiency at unity power factor. Thus, one will have maximum efficiency if load is nearly equal to full load and at unity power factor.

8. Why efficiency of a transformer, under heavy loads, is comparatively low?

a) Copper loss becomes high in proportion to the output

b) Iron loss is increased considerably

c) Voltage drop both in primary and secondary becomes large

d) Secondary output is much less as compared to primary input

View Answer

Answer: a

Explanation: At heavy loads current drawn by the transformer circuit increases, as we know, variable copper losses are proportional to the square of the current. Thus, we'll get higher copper loss in proportion to the output.

9. The efficiencies of transformers compared to electric motors of the same power are _____

a) About the same

b) Much smaller

c) Much higher

d) Can't comment

View Answer

Answer: c

Explanation: Transformer is a highly efficient device compare to all other electrical instruments. In motor we need to add windage and friction losses along with the copper losses and iron losses thus, we'll get lee efficiency for motor compare to transformer.

10. A transformer having maximum efficiency at 75% full load will have ratio of iron loss and full load copper loss equal to _____

a) 4/3

b) 3/4

c) 9/16

d) 16/9

View Answer

Answer: c

Explanation: Condition for maximum efficiency is, Copper loss= Iron loss, i.e. Pc= I2 R = Pi. transformer can be operated at any load but maximum efficiency occurs at a particular load condition only. Let x be that load factor corresponds to maximum efficiency. Given that, maximum efficiency will occur at 3/4 load. The load factor= (3/4)2.

11. What is the correct formula of efficiency of a device?

a) Input /output

b) Output/losses

c) 1- (losses/ (output + losses))

d) Cannot be determined

View Answer

Answer: c

Explanation: Efficiency of any device is equal to the ratio of output power to the input power. Here, one can write input power is equal to the addition of output power with losses. Thus, expressing all these terms mathematically will give the answer.

12. A 500 kVA transformer is having efficiency of 95% at full load and also at 60% of full load; both at unity power factor. Then Pi is _____

a) 16.45 kW

b) 9.87 kW

c) 14.57 kW

d) Can’t be calculated

View Answer

Answer: b

Explanation: Efficiency of a transformer is given by, [transformer capacity*loading/ (capacity*loading + Pi + k2*PC)]. Thus, η= 500*1/ (500 + Pi +PC) = 0.95. also from the second condition given η= 500*0.6/ (500*0.6 + Pi +0.6^2*PC) = 0.95. Thus, solving simultaneously we get 9.87 kW.

13. A 500 kVA transformer is having efficiency of 95% at full load and also at 60% of full load; both at unity power factor. Then Pc is _____

a) 16.45 kW

b) 9.87 kW

c) 14.57 kW

d) Can’t be calculated

View Answer

Answer: a

Explanation: Efficiency of a transformer is given by, [transformer capacity*loading/ (capacity*loading + Pi + k2*PC)]. Thus, η= 500*1/ (500 + Pi +PC) = 0.95. also from the second condition given η= 500*0.6/ (500*0.6 + Pi +0.62*PC) = 0.95. Thus, solving simultaneously we get an answer 16.45 kW.

14. For a power transformer operating at full load it draws voltage and current equal to 200 V and 100 A respectively at 0.8 pf. Iron and copper losses are equal to 120 kW and 300kW. What is the efficiency?

a) 86.44%

b) 96.44%

c) 97.44%

d) 99.12%

View Answer

Answer: c

Explanation: Power output= VI cosθ= 200*100*0.8 = 16000 W (Independent of lag and lead). While total losses are equal to iron loss+ k2*copper losses =120+ 300= 420 W. Efficiency is equal to 1- 420/(16000+420)= 97.44%.

This set of Transformers Multiple Choice Questions & Answers (MCQs) focuses on “Voltage Regulation-1”.

1. The highest voltage for transmitting electrical power in India is _____

a) 33 kV

b) 66 kV

c) 132 kV

d) 00 kV

View Answer

Answer: d

Explanation: Transmission voltage in power transfer in India (highest) is 750KV AC and these lines are erected by Power Grid Corporation for interstate connections throughout India. However, work on 800KV is in the progress. DC transmission voltage (highest) in India is 600KV.

2. A transformer can have zero voltage regulation at _____

a) Leading power factor

b) Lagging power factor

c) Unity power factor

d) Zero power factor

View Answer

Answer: a

Explanation: At leading power factor the voltage regulation is given by I*(Rcosφ- Xsinφ). Thus, at a particular condition of angle φ we may get zero voltage regulation. While in lagging power factor case we have + sign in the above formula.

3. What will happen to a given transformer if it made to run at its rated voltage but reduced frequency?

a) Flux density remains unaffected

b) Iron losses are reduced

c) Core flux density is reduced

d) Core flux density is increased

View Answer

Answer: d

Explanation: E=4.44fNAB is the emf equation for a transformer, now as E is kept constant we can say frequency is inversely proportional to the B value. Thus, as frequency increases we will get less core flux density and vice-versa.

4. In an actual transformer the iron loss remains practically constant from no load to full load because _____

a) Value of transformation ratio remains constant

b) Permeability of transformer core remains constant

c) Core flux remains practically constant

d) Primary voltage remains constant

View Answer

5. Negative voltage regulation indicates _____

a) Capacitive loading only

b) Inductive loading only

c) Inductive or resistive loading

d) Cannot be determined

View Answer

Answer: a

Explanation: The sign -ve arises in the voltage regulation calculations when, the load connected to the transformer is leading in the nature. The only condition when we'll get negative voltage regulation when second term is higher than first term.

6. When will a transformer have regulation closer to zero?

a) On full-load

b) On overload

c) On leading power factor

d) On zero power factor

View Answer

Answer: c

Explanation: Since voltage regulation of a transformer in the leading loading condition is not additive in nature, at particular power factor in leading we can get zero voltage regulation. While, in lagging condition we'll get ultimately non-zero VR.

7. A good voltage regulation of a transformer indicates _____

a) output voltage fluctuation from no load to full load is least

b) output voltage fluctuation with power factor is least

c) difference between primary and secondary voltage is least

d) difference between primary and secondary voltage is maximum

View Answer

Answer: a

Explanation: Voltage regulation is defined as rise in the voltage when the transformer is thrown off from full load condition to no-load condition. Thus, least voltage regulation means output fluctuations depending on the load are very less.

8. Which of the following acts as a protection against high voltage surges due to lightning and switching?

a) Horn gaps

b) Thermal overload relays

c) Breather

d) Conservator

View Answer

Answer: a

Explanation: Arcing horns in a transformer form a spark gap across the insulator with a lower breakdown voltage than the air path along the insulator surface, so an overvoltage it will cause the air to break down and the arc to form between the arcing horns, diverting it away from the surface of the insulator.

9. Minimum voltage regulation occurs when the power factor of the load is _____

a) Unity

b) Lagging

c) Leading

d) Zero

View Answer

Answer: c

Explanation: When the leading load is connected to the transformer difference of Rcosφ and Xsinφ is multiplied with the current, thus we may get -ve, zero voltage regulations at this condition. That is minimum voltage regulation.

This set of Transformers Questions and Answers for Freshers focuses on “Voltage Regulation – 2”.

1. Voltage regulation of transformer is given by _____

a) E2-V2/V2

b) E2-V2/E2

c) V2-E2/E2

d) V2-E2/V2

View Answer

Answer: b

Explanation: Voltage regulation is defined as change in the voltage or rise in voltage when transformer is load is thrown off. Thus, it is the difference of the no load voltage with the full load voltage divide by full load voltage to get % increase.

2. On which load power factor zero voltage regulation will be achieved?

a) 0

b) 1

c) Leading

d) Lagging

View Answer

Answer: c

Explanation: At leading power factor the voltage regulation can be negative or zero. This can be found from this equation % regulation = εxcosθ – εrsinθ. Bu substituting the appropriate value of angle one can check this mathematically.

3. A transformer has resistance and reactance in per unit as 0.01 and 0.04 pu respectively. What will be its voltage regulation for 0.8 power factor lagging and leading?

a) 3.2% and 1.6%

b) 3.2% and -1.6%

c) 1.6% and -3.2%

d) Can’t be defined

View Answer

Answer: b

Explanation: Voltage regulation for lagging power factor = (R cosθ + X sinθ) × 100, Voltage regulation for 0.8 lagging power factor = (0.01×0.8+0.04×0.6) × 100 = 3.2%. Voltage regulation for leading power factor = (R cosθ – X sinθ) × 100, Voltage regulation for 0.8 leading power factor = (0.01×0.8-0.0 4×0.6) × 100 = -1.6%.

4. At which power factor one will get maximum voltage regulation?

a) 0

b) 1

c) Leading

d) Lagging

View Answer

Answer: d

Explanation: At lagging power factor the voltage regulation is given by I*(Rcosφ+ Xsinφ). Thus, at a particular condition of angle φ we will get maximum voltage regulation. While in leading power factor case we have – sign in the above formula.

5. Which is the correct phasor equation indicating the transformer voltages lagging?

a) V1 = V2 + I*(R cosφ+ X sinφ)

b) V2 = V1 + I*(R cosφ+ X sinφ)

c) V1 = V2 + I*(X cosφ+ X sinφ)

d) V1 = V2 + I*(R cosφ+ R sinφ)

View Answer

Answer: a

Explanation: According to the phasor diagram drawn for lagging current, we will have positive sign in the voltage regulation formula thus, V1 = V2 + I*(R cosφ+ X sinφ) gives the correct relation, while V1 indicates the primary voltage.

6. Which is the correct phasor equation indicating the transformer voltages leading?

a) V1 = V2 + I*(R cosφ- X sinφ)

b) $V2 = V1 + I*(R \cos\varphi - X \sin\varphi)$

c) $V1 = V2 + I*(X \cos\varphi - X \sin\varphi)$

d) $V1 = V2 + I*(R \cos\varphi - R \sin\varphi)$

View Answer

Answer: a

Explanation: According to the phasor diagram drawn for leading current, we will have negaitive sign in the voltage regulation formula thus, $V1 = V2 + I*(R \cos\varphi - X \sin\varphi)$ gives the correct relation, while V1 indicates the primary voltage.

7. What is the correct formula to get power factor angle in leading condition?

a) $\tan \varphi = X/R$

b) $\tan \varphi = R/X$

c) $\cos \varphi = R/\sqrt{(R2+X2)}$

d) $\cos \varphi = R/X$

View Answer

Answer: b

Explanation: For leading condition derivative of voltage regulation with respect to φ is obtained and solved for the power factor angle calculations we'll get $\tan \varphi = R/X$ for leading condition, for lagging condition we'll get $\tan \varphi = X/R$.

8. What is the correct formula to get power factor angle in lagging condition?

a) $\sin \varphi = X/R$

b) $\tan \varphi = R/X$

c) $\cos \varphi = R/\sqrt{(R2+X2)}$

d) $\cos \varphi = R/X$

View Answer

Answer: c

Explanation: For lagging condition derivative of voltage regulation with respect to φ is obtained and solved for the power factor angle calculations we'll get tan φ = R/X for leading condition, for lagging condition we'll get tan φ= X/R. In terms of cosine function, we'll get cos φ = R/√(R2+X2).

9. Zero voltage regulation of a transformer is achieved at 1 pf leading.

a) True

b) False

View Answer

Answer: b

Explanation: Though zero voltage regulation occurs at leading power factor condition, it is not occurring at unity power factor leading. As at unity power factor leading, cos term will be equal to 1. Hence, we'll get some non-zero VR at unity power factor.

This set of Transformers Multiple Choice Questions & Answers (MCQs) focuses on "Autotransformer".

1. Which of the following is the main advantage of an auto-transformer over a two-winding transformer?

a) Hysteresis losses are reduced

b) Saving in winding material

c) Copper losses are negligible

d) Eddy losses are totally eliminated

View Answer

Answer: b

Explanation: Auto transformer is a special type of transformer which has primary and secondary winding both located on same winding. Thus, winding material required for a transformer is very less in the case of autotransformer.

2. Auto-transformer makes effective saving on copper and copper losses, when its transformation ratio is

a) Approximately equal to one

b) Less than one

c) Great than one

d) Cannot be found

View Answer

Answer: a

Explanation: Copper In auto transformer /copper in two-winding transformer = 1- T2/T1. This means that an auto transformer requires the use of lesser quantity of copper given by the ratio of turns. Hence, if the transformation ratio is approximately equal to one, then the copper saving is good and the copper loss is less.

3. Total windings present in a autotransformer are _____

a) 1

b) 2

c) 3

d) 4

View Answer

Answer: a

Explanation: Autotransformer is the special transformer for which the single winding acts as a primary and secondary both. Thus, by taking the appropriate winding into consideration a variable secondary voltage is obtained.

4. Autotransformers are particularly economical when _____

a) Voltage ratio is less than 2

b) Voltage ratio is very high

c) Voltage ratio is higher than 2 in smaller range

d) Can be used anywhere

View Answer

Answer: a

Explanation: Autotransformer is economical where the voltage ratio is less than 2 in which case electrical isolation of the two windings is not essential. The major applications are induction motor starters, interconnection of HV systems at voltage levels with ratio less than 2, and in obtaining variable voltage power supplies (low voltage and current levels).

5. Which of the following is not true regarding the autotransformer compare to two-winding transformer?

a) Lower reactance

b) Lower losses

c) Higher exciting current

d) Better voltage regulation

View Answer

Answer: c

Explanation: Autotransformer is the advance version of normal transformer. It is having better voltage regulation, higher efficiency due to lower losses, lower reactance and thus it also requires very small exciting current.

6. Two-winding transformer of a given VA rating if connected as an autotransformer can handle _____

a) Higher VA

b) Lower VA

c) Same VA

d) Cannot be found

View Answer

Answer: a

Explanation: A two-winding transformer of a given VA rating when connected as an autotransformer can handle higher VA. This is because in the autotransformer connection part of the VA is transferred conductively.

7. When auto-transformation ratio becomes equal to 1, which of the following statement is true?

a) VA rating of the autotransformer becomes far greater than VA rating of two winding transformer

b) VA rating of the autotransformer becomes far lower than VA rating of two winding transformer

c) VA rating of the autotransformer becomes equal to VA rating of two winding transformer

d) Can't comment

View Answer

Answer: a

Explanation: VA rating of autotransformer is = [1/1-a] * VA of two-winding transformer, thus, when a i.e. transformation ratio of autotransformer becomes closer to 1 one gets very high value of VA rating of an autotransformer.

8. An autotransformer compared to its two-winding counterpart has a higher operating efficiency.

a) True

b) False

View Answer

Answer: a

Explanation: The losses are less in autotransformer compare to two-winding transformer. Thus, for the given same input to autotransformer as that of two-winding transformer more output will be available to secondary side.

9. Ratio of winding material needed for autotransformer to thr two winding transformer is _____

a) 1- V2/V1

b) 1- N2/N1

c) 1- V2/V1 and 1- N2/N1

d) 1- V1/V2

View Answer

Answer: c

Explanation: Gauto/GTW= 1- V2/V1, as voltage is directly proportional to the number of turns we can say the value is also equal to the 1- N2/N1. Thus, one can write GTW-Gauto = 1/a' * GTW = saving of the conductor material using autotransformer.

10. For an auto-transformation ratio tending to the unity value, saving of the conductor material will be _____

a) Tend towards 90% or more

b) Tend towards 0%

c) Can't say

d) Wil remain fix

View Answer

Answer: a

Explanation: GTW-Gauto = 1/a' * GTW = saving of the conductor material using autotransformer. So, if a'=10, saving is only 10% but for a'=1.1, saving is as high as 90%. Hence it is more economical when the turn-ratio is closer to unity.

11. What are the modes in which power can be transferred in an autotransformer?

a) Conduction

b) Induction

c) Conduction and Induction

d) Cannot be said

View Answer

Answer: c

Explanation: In two winding transformer there is no electrical connection between primary and secondary. So, the power is transferred through induction. But in auto-transformer there is a common electrical path between primary and secondary. So, power is transferred through both conduction and induction processes.

12. A 100/10, 50 VA double winding transformer is converted to 100/110 V auto transformer. tWhat will be the rating of auto transformer?

a) 500 VA

b) 550 VA

c) 100 VA

d) 110 VA

View Answer

Answer: b

Explanation: Secondary current of the two-winding transformer at rated voltage supply = 50/10= 5 A

Thus, autotransformer will also carry the same rated current in secondary giving the power output as 5*110= 550 VA.

13. For a 20kVA transformer with turn ratio 0.4 what amount of total power is transferred inductively?

a) 8kVA

b) 12kVA

c) 10kVA

d) 50kVA

View Answer

Answer: b

Explanation: For an auto transformer power is transferred partially inductively and partially conductively. Thus, out of total power, power transferred inductively is given by (1-k)*total power= 0.6*20= 12kVA.

14. For a 20kVA transformer with turn ratio 0.4 what amount of total power is transferred conductively?

a) 8kVA

b) 12kVA

c) 10kVA

d) 50kVA

View Answer

Answer: a

Explanation: For an auto transformer power is transferred partially inductively and partially conductively. Thus, out of total power, power transferred conductively is given by (k)*total power= 0.4*20= 8kVA.

This set of Transformers Multiple Choice Questions & Answers (MCQs) focuses on “Three Phase Transformer Connections”.

1. When does star/star transformers work satisfactorily?

a) Load is unbalanced only

b) Load is balanced only

c) On balanced as well as unbalanced loads

d) Independent of load type

View Answer

Answer: b

Explanation: With the unbalanced load connected to the neutral, the neutral point shifts thereby making the three line-to-neutral (i.e. phase) voltages unequal. The effect of unbalanced loads can be illustrated by placing a single load between phase (or coil) a and the neutral on the secondary side.

2. When does delta/star transformer work satisfactorily?

a) Load is balanced only

b) Load is unbalanced only

c) On balanced as well as unbalanced loads

d) Independent of load type

View Answer

Answer: c

Explanation: Large unbalanced/balanced loads can be handled satisfactory. The Y-D connection has no problem with third harmonic components due to circulating currents in D(delta). It is also more stable to unbalanced loads since the D partially redistributes any imbalance that occurs.

3. Scott connections are used in _____

a) three-phase to single phase transformation

b) three-phase to two-phase transformation

c) single phase to three-phase transformation

d) all phase transformations

View Answer

Answer: b

Explanation: Scott connections are used to convert three-phase to two-phase conversion, to start two phase motors and two phase furnaces. It requires two single phase transformers with adjustable tappings, one transformer is main transformer which is centre tapped through teaser transformer primary with a suitable number of turns to get a balanced two-phase supply.

4. In a three-phase star – delta transformer, what is the angle difference between primary and secondary phase voltages?

a) Delta side leads by 300

b) Delta side lags by 300

c) Star side leads by 300

d) Star side lags by 300

View Answer

Answer: a

Explanation: This is a vector group and has + 30° displacement. Therefore, delta side leads by + 30°. So, it can be stated that delta side is having lead of 300 over star side because of the connections made.

5. Which can be also called as 00 /1800 connection?

a) Star/star

b) Direct star

c) Delta/star

d) Star/delta

View Answer

Answer: a

Explanation: Star connection is formed on each side by connecting together phase winding terminals. The voltages of the corresponding phases (and thus of the corresponding lines) are in phase. This is known as the 0°-connection. If the winding terminals on secondary side are reversed, the 180°-connection is obtained.

6. What is the ratio of transformation of star/star connection?

a) Phase transformation x:1, line transformation x:1

b) Phase transformation x:1, line transformation 2x:1

c) Phase transformation x:1, line transformation x/3:1

d) Can’t say

View Answer

Answer: a

Explanation: The phase transformation ratio is given as x:1, where x simply denotes the turns ratio of a transformer given, thus, in the star/star connection we will get the same ratios, as at a particular point, voltage reading on primary will be proportional to secondary with x.

7. Delta/delta connection is also called as _____

a) 00-connection

b) 900-connection

c) 1800-connection

d) 00/1800-connection

View Answer

Answer: d

Explanation: Delta/delta connection is also called as 00-connection as seen from the phasor diagram that primary and secondary line voltages are in phase with each other. By reversing connection, we can get 1800 phase shift.

8. What is the ratio of transformation of delta/delta connection?

a) Phase transformation x:1, line transformation x:1

b) Phase transformation x:1, line transformation 2x:1

c) Phase transformation x:1, line transformation x/3:1

d) Can't determine

View Answer

Answer: a

Explanation: The phase transformation ratio is given as x:1, where x simply denotes the turns ratio of a transformer given, thus, in the delta/delta connection also similar to the star/star, we will get the same ratios, as at a particular point, voltage reading on primary will be proportional to secondary with x.

9. Open delta connection has VA rating of _____

a) √3 times delta/delta VA rating

b) 1/√3 times delta/delta VA rating

c) 3 times delta/delta VA rating

d) 1/3 times delta/delta VA rating

View Answer

Answer: b

Explanation: When one of the transformer in delta/delta connection is removed we get open delta connection. This connection can handle the power of √3VI. While on the similar line delta/delta connection can handle the power of 3VI.

10. Star/delta connection is also called as _____

a) 300-connection

b) 00-connection

c) -300-connection

d) 300/-300-connection

View Answer

Answer: d

Explanation: Star/delta connection is also called as +/-300-connection as seen from the phasor diagram that primary and secondary line voltages are either ahead or below by 300 phases with each other. By reversing connection, we can get another condition phase shift.

11. What is the ratio of transformation of star/delta connection?

a) Phase transformation x:1, line transformation x:1

b) Phase transformation x:1, line transformation √3x:1

c) Phase transformation x:1, line transformation 3x:1

d) Can’t determine with information available

View Answer

Answer: a

Explanation: The phase transformation ratio is given as x:1, where x simply denotes the turns ratio of a transformer given, thus, in the star/delta connection we will get the √3 factor in ratios, as at a particular point, voltage reading on primary will be proportional to secondary with √3x.

12. x/√3:1 ratio is obtained in _____

a) Star/delta

b) Delta/star

c) Delta/delta

d) Star/star

View Answer

Answer: b

Explanation: The phase transformation ratio is given as x:1, where x simply denotes the turns ratio of a transformer given, thus, in the star/delta connection we will get the 1/√3 factor in ratios, as at a particular point, voltage reading on primary will be proportional to secondary with 1/√3x.

13. Which both connections have the same line transformation ratios?

a) Star/star and delta/delta

b) Star/delta and delta/star

c) Star/zig-zag star and delta/zig-zag star

d) Star/star, delta/delta and star/delta, delta/star

View Answer

Answer: d

Explanation: Star/star and delta/delta both connections have phase transfer ratio of x:1 and line transfer ratio also equal to x:1, while star/zig-zag star and delta/zig-zag star connections have line transformation ratio equal to 2/√3x:1.

This set of DC Machines Multiple Choice Questions & Answers (MCQs) focuses on “Ward Leonard Speed Control Method”.

1. Ward Leonard method is _____

a) Armature control method

b) Field control method

c) Combination of armature control method and field control method

d) Totally different from armature and field control method

View Answer

Answer: c

Explanation: Ward Leonard method is the combination of armature control method and field control method, which can also be called as voltage control method. This is the most efficient method of speed control over wide range.

2. Which of the following component is not used in Ward Leonard method?

a) AC motor

b) DC generator

c) DC motor

d) AC generator

View Answer

Answer: d

Explanation: Whole unit of Ward Leonard speed control unit consists of various units like DC generator, DC motor, AC motor, exciter circuit and various pots which are used for carrying out smooth operation.

3. In Ward Leonard speed control method for lowering the speed of the motor _____

a) Reduce armature voltage

b) Increase armature voltage

c) Increase field current

d) Decrease field current

View Answer

Answer: a

Explanation: In Ward Leonard speed control method, speed can be reduced under base value by reducing armature voltage. By increasing field current speed can be reduced but this is not employed in Ward Leonard method.

4. Reducing the armature voltage will give us _____

a) Variable torque speed control

b) Constant torque speed control

c) Variable and constant both can be achieved

d) Cannot comment on torque

View Answer

Answer: b

Explanation: As seen from speed torque characteristics, reducing armature voltage will reduce the speed of the motor below base value but torque will remain same. Thus, reducing armature voltage will give constant torque speed control.

5. In Ward Leonard speed control method for increasing the speed of the motor _____

a) Reduce armature voltage

b) Increase armature voltage

c) Increase field current

d) Decrease field current

View Answer

Answer: d

Explanation: In Ward Leonard speed control method, speed can be increased above base value by weakening of the field, which can be done by lowering field current value. By increasing armature voltage speed can be increased but this is not employed in Ward Leonard method.

6. Reducing the field current will give us _____

a) Constant torque and variable power speed control

b) Constant torque speed control

c) Variable power speed control

d) Constant power speed control

View Answer

Answer: b

Explanation: As seen from speed torque characteristics, reducing field current will increase the speed of the motor above base value but power will remain same. Thus, reducing armature voltage will give constant power speed control, with variable torque.

7. Speed-power characteristic for Ward Leonard speed control method _____

a) Will start from origin

b) Will start from some positive value on power axis

c) Will start from some positive value on speed axis

d) Depends on other parameters

View Answer

Answer: a

Explanation: Speed power characteristic of DC motor is plotted when, Ward Leonard speed control method is employed. For speed equal to zero, which is less than base speed, we get constant torque but variable power operation. Thus, power will start increasing from origin.

8. Efficiency of Ward Leonard method is _____

a) Higher than rheostatic control method but lower than shunted field control method

b) Lower than rheostatic control method

c) Higher than rheostatic control method and shunted field control method

d) Depends on load

View Answer

Answer: c

Explanation: Unlike all other methods, external resistance is not added in the circuit of control system. Thus, efficiency of Ward Leonard control method is always highest at various different speeds.

9. Ward Leonard method is an ideal choice for motor which undergoes frequent starting, stopping, speed reversal.

a) True

b) False

View Answer

Answer: a

Explanation: Absence of external resistance increases efficiency. Also, when the generator emf becomes less than the back emf of the motor, electrical power flows back from motor to generator, is converted to mechanical form and is returned to the mains via the driving ac motor. This aspect makes Ward Leonard method perfect for given application.

10. Starting gear used in Ward Leonard method_____

a) Is of small size

b) Is of large size

c) Size depends on application

d) Is absent

View Answer

Answer: d

Explanation: No special starting gear is required in Ward Leonard method of speed control. As the induced voltage by generator is gradually raised from zero, the motor starts up smoothly. Speed reversal is smoothly carried out.

11. To get the speed of DC motor below the normal speed without wastage of electrical energy we use _____

a) Ward Leonard control

b) Rheostatic control

c) Any of the Ward Leonard or rheostatic method can be used

d) Not possible

View Answer

Answer: a

Explanation: Ward Leonard method of speed control is most efficient method of speed control in all aspects. We can get constant torque operation and constant power operations as well, with this method.

12. Speed control by Ward Leonard method, can give uniform speed variation _____

a) In both directions

b) In one direction

c) Below normal speed only

d) Above normal speed only.

View Answer

Answer: a

Explanation: Speed control by Ward Leonard method, gives uniform speed variation in both the directions and above and below of normal speed as well. Speed reversal is carried out smoothly by this control method.

13. Ward Leonard control is basically a _____

a) Voltage control method

b) Field diverter method

c) Field control method

d) Armature resistance control method

View Answer

Answer: a

Explanation: Ward Leonard speed control method is combination of rheostatic series control method and shunted armature control method with field control as well. Thus, it can be called as voltage control method also.

14. In Ward Leonard control of DC motor, the lower limit of speed is imposed by _____

a) Residual magnetism of the generator

b) Core losses of motor

c) Mechanical losses of motor and generator together

d) Cannot be determined

View Answer

Answer: a

Explanation: We get the speed below the base value by reducing armature voltage, which is the simple method of reducing back emf which is proportional to the residual magnetism. Thus, lower limit of speed is imposed by residual magnetism of the generator.

15. The disadvantage of the Ward Leonard control method is _____

a) High initial cost

b) High maintenance cost

c) Low efficiency at high loads

d) High cost, high maintenance and low efficiency

View Answer

Answer: d

Explanation: Ward Leonard speed control method requires large number of building blocks like generators, motors. Thus, installing cost and maintenance cost of the whole unit is very high. Apart from cost, it gives low efficiency at very high loads.

This set of DC Machines Multiple Choice Questions & Answers (MCQs) focuses on “Braking of DC Motors – 1”.

1. Which of the following is the best braking method?

a) Friction

b) Electromechanical action

c) Eddy-currents

d) Electric braking

View Answer

Answer: d

Explanation: Braking methods based on friction, electromechanical action, eddy-currents, etc. are independent of the motor but sometimes electric braking is better justified owing to its greater economy and absence of brake wear.

2. DC motor is still widely used in tractions due to its excellent braking properties.

a) True

b) False

View Answer

Answer: b

Explanation: Dc motor is used in tractions because of its excellent braking characteristics and ability of smooth transition from the motor to the generator mode and vice versa. Also, characteristics suit perfectly for traction application.

3. Which of the following is not the method of electrical braking?

a) Plugging or counter-current

b) Dynamic or rheostatic

c) Regenerative

d) Eddy current

View Answer

Answer: d

Explanation: Eddy current is the electrical effect or response of the system, which is reflected mechanically at brakes to reduce the speed of the motor. Thus, eddy current is not an electrical brake, it is mechanical one.

4. Which of the following is the plugging method of braking?

a) Reversal of field connections

b) Reversal of armature connections

c) Addition of equal and opposite field

d) Removal of field circuit from current machine circuit

View Answer

Answer: b

Explanation: Plugging is method where connections are reversed at a given instant. Because of the problem of interrupting highly inductive field current and the time needed for the field current to build up in opposite direction, it is a common practice to reverse armature connections.

5. Which of the following is correct formula for braking torque in plugging?

a) n (ka2/Rb)

b) n2 (ka2/Rb)

c) n-1 (ka2/Rb)

d) (ka2/Rb)

View Answer

Answer: a

Explanation: Braking torque is equal to braking power divided by speed of the motor.

T= [(nka)2/Rb]/n. As, Braking power is equal to Ea2/Rb/n. By solving for the braking torque from the above equation, we get n (ka2/Rb).

6. Electrical braking of any variety becomes less effective as _____

a) Speed increases

b) Speed decreases

c) Independent of speed

d) Depends on supply voltage

View Answer

Answer: b

Explanation: Braking torque of the DC machine is given by n (ka2/Rb). Here, braking torque is directly proportional to the speed of the motor, so as the speed decreases the efficiency of electrical brakes which is dependent on braking torque decreases.

7. Plugging is applied in a motor, if we don’t make the switch OFF what will happen?

a) Motor will come to rest as a result of plugging

b) Motor will come to rest and will start rotating in another direction

c) Motor will burn

d) Nothing will happen

View Answer

Answer: b

Explanation: If the switch is kept ON near to zero speed, motor will have braking torque acting in opposite direction greater than the electromechanical torque. Thus, motor will come to rest and for the next instant motor will start rotating in opposite direction.

8. Plugging is used in _____

a) Small motors only

b) Small and medium powered

c) Only in large heavy machines

d) Everywhere

View Answer

Answer: a

Explanation: Plugging is used in small scale applications only. The large initial current and high mechanical stress restrict the application of plugging in large machines. So, in order to balance stress this method is used in small machines only.

9. Which of the following is dynamic braking?

a) Reversal of field connections

b) Reversal of armature connections

c) Addition of equal and opposite field

d) Removal of armature circuit from current machine circuit

View Answer

Answer: d

Explanation: Reversal of the connections of armature is the method called plugging. In dynamic braking we remove the armature circuit and connect it to different resistor, with field circuit still connected to the external supply.

10. Braking time in the dynamic braking is the function of _____

a) System inertia

b) Load torque

c) Motor rating

d) All- system inertia, load torque and motor rating

View Answer

Answer: d

Explanation: In dynamic braking, when brakes are applied the armature is disconnected from machine circuit and connected to the braking resistor. Now, at this point motor is driven by kinetic energy gained earlier, dissipating power in braking resistor.

11. In dynamic braking, when braking is applied system acts as _____

a) Freely running machine

b) Motor with slow speed

c) Generator

d) Motor with same speed in opposite direction

View Answer

Answer: c

Explanation: The armature is disconnected from the supply and then a braking resistor Rb is immediately connected across it. The motor acts as a generator, driven by the inertia and stored kinetic energy dissipating power in Rb. This is a simple method of bringing a motor nearly to a standstill.

12. In which of the following electrical braking method, energy is supplied back to the supply?

a) Plugging

b) Dynamic braking

c) Regenerative braking

d) In all electrical braking

View Answer

Answer: c

Explanation: In plugging energy is wasted in braking resistance which is equal to starting resistance while running as a motor. In dynamic braking energy is generated but it is not fed back to supply. In regenerative method energy is sent back for reuse.

This set of DC Machines Question Bank focuses on “Braking of DC Motors – 2”.

1. Regenerative braking is used when duty cycle _____

a) Requires braking of machine

b) Requires accelerating of machine

c) Requires constancy of machine

d) Cannot comment on duty cycle

View Answer

Answer: a

Explanation: Regenerative braking is used specially where the duty cycle requires the braking or slowing of the machine more frequently and is most useful in holding a descending load of high potential energy at a constant speed.

2. Regeneration is not easily possible for _____

a) DC shunt motor

b) Separately excited motor

c) Compounding motor with weak series compounding

d) DC series motor

View Answer

Answer: d

Explanation: Regeneration is possible with a shunt and separately excited motors and with compound motors with weak series compounding. Series motors need a reversal of either the field or the armature connections.

3. Which of the following method is not used for regeneration?

a) Increasing field current

b) Increasing armature speed

c) Increasing supply voltage

d) Reducing supply voltage

View Answer

Answer: c

Explanation: Regeneration is achieved by either increasing field current, increasing armature speed, or by reducing supply voltage. Increasing supply voltage is not the method which is employed in regeneration process.

4. If the terminals of armature of DC motor are interchanged, this action will offer following kind of electrical braking _____

a) Regenerative

b) Plugging

c) Dynamic braking

d) Depends on other parameters

View Answer

Answer: b

Explanation: Plugging is electrical braking method, where field or armature connections are reversed technically. But field reversal is not employed as results obtained from field reversal are not good compare to armature reversal.

5. The plugging braking gives the _____

a) Zero torque braking

b) Smallest torque braking

c) Highest torque braking

d) Variable torque braking

View Answer

Answer: c

Explanation: In electrical braking called plugging direct reversal of connections is done, which causes maximum torque to act on shaft but in opposite direction. As the speed decreases this torque also starts decreasing.

6. Regenerative method of braking is based on _____

a) Back emf is less than the applied voltage

b) Back emf is equal to the applied voltage

c) Back emf of rotor is more than the applied voltage

d) Cannot be determined

View Answer

Answer: c

Explanation: The condition for regeneration is that the rotational emf is more than the applied voltage so that the current is reversed and the mode of operation changes from motoring to generating.

7. During regenerative braking of DC motors _____

a) Motor will run as a generator

b) Motor will reverse in direction

c) Motor will run at reduced speed

d) Motor will run as free rotating shaft

View Answer

Answer: a

Explanation: In regenerative method of electrical braking, motor is suddenly forced to act as a generator, all the energy then obtained is pushed back into the supply unlike in dynamic braking this energy is wasted.

8. Where dynamic braking is used?

a) Shunt motors

b) Series motors

c) Compound motors

d) All DC motors

View Answer

Answer: d

Explanation: Dynamic braking is used in all DC motors though its implantation in series DC motor requires one more additional step of reversal of connections. Only care taken is, addition of braking resistance, armature resistance and series field resistance is lower than the critical resistance at that speed.

9. Which method of braking is generally used in elevators?

a) Plugging

b) Regenerative braking

c) Rheostatic braking

d) Mechanical braking

View Answer

Answer: a

Explanation: Plugging braking provides maximum torque in opposite direction at the instant of braking, this characteristic of braking suits perfectly with the application that is in elevators. If switch is kept ON, we get reverse rotation also.

10. For which of the following motor dynamic braking is very effective?

a) Shunt motors

b) Separately excited motors

c) Series motors

d) Differential compound motors

View Answer

Answer: b

Explanation: Dynamic braking is very effective for separately excited DC motors. As in separately excited motors the direction of field can be very easily altered by altering the terminals of the field, which is the condition in dynamic braking.

11. When is the dynamic braking is employed?

a) Non-reversing drive

b) Reversing drive

c) Both Reversing and Non-reversing

d) Cannot tell

View Answer

Answer: c

Explanation: Dynamic braking is employed to brake both reversing drives and non-reversing drives.

In dynamic braking, the electrical energy generated during stopping action is released as heat through a voltage regulated transistor and resistor.

This set of DC Machines Multiple Choice Questions & Answers (MCQs) focuses on "Swinburne's Test".

1.Swinburne's test can be carried out on all DC motors.

a) True

b) False

View Answer

Answer: b

Explanation: Swinburne's test is a no-load test; thus, it is performed only on shunt and compound motors. DC series motor is not advisable to start at no-load so, this test can't be performed on series motor.

2. Which of the following test will be suitable for testing two similar DC series motors of large capacity?

a) Swinburne's test

b) Hopkinson's test

c) Field test

d) Brake test

View Answer

Answer: c

Explanation: As Swinburne's test and Hopkinson's test are no-load test, one can't perform these tests on DC series motor. For DC series motor with large capacities, we conduct field test to find various losses occurring in a machine.

3. Which losses can be identified from Swinburne's test?

a) No-load core loss

b) Windage and friction loss

c) No-load and windage and friction loss

d) Stray load loss

View Answer

Answer: c

Explanation: We get total rotational losses occurring in a machine, which are equal to no-load core losses (iron + copper) and windage and friction losses. We also get shunt field losses and variable loss occurring in armature resistance.

4. While carrying out Swinburne's test at rated armature voltage motor will run at _____

a) Speed equal to rated speed

b) Speed greater than rated speed

c) Speed less than rated speed

d) Can run anywhere

View Answer

Answer: b

Explanation: The motor is set to run on a rated speed while conducting Swinburne's test by adjusting field current to rated value. When rated armature voltage is applied, motor runs with slightly greater speed than the rated one as some o the losses are not taken into account.

5. In order to run motor on rated speed while carrying out Swinburne's test we add _____

a) Resistance in parallel with armature

b) Resistance in series with armature

c) Inductor in series with armature

d) Capacitor in parallel with armature

View Answer

Answer: b

Explanation: The machine would run at higher than rated speed with a rated armature voltage. Therefore, a series in the armature circuit is employed to reduce voltage applied to the motor armature such that it runs at rated speed.

6. What is the purpose of performing retardation test after Swinburne's test?

a) To find stray load loss

b) To find variable losses

c) To separate out windage and friction losses

d) To find shunt field losses

View Answer

Answer: c

Explanation: While performing Swinburne's test we get addition of all losses. So, if we want to treat each loss individually, one needs to separate them. Retardation test is thus used by disconnecting both armature and field of the running motor.

7. Efficiency calculated by Swinburne's test is _____

a) Exactly equal

b) Over-estimated

c) Under-estimated

d) Depends on the manual errors

View Answer

Answer: b

Explanation: The stray-load loss cannot be determined by this test and hence efficiency is over-estimated. Correction can be applied after assuming the stray-load loss to be half the no-load loss, which is done generally. Also, temperature may effect on resistance value which is not considered in this test.

8. Which of the following is not a disadvantage of a Swinburne's test?

a) The stray-load losses can't be determined by this test

b) Steady temperature rise can't be determined

c) Does not give results about satisfactory commutation

d) Machine gets damaged

View Answer

Answer: d

Explanation: For increasing life and durability of a machine we carry out such tests. But stray load losses, steady temperature rise is not determined by this method. Also, results about satisfactory commutation are not given by this method.

9. While carrying out retardation test, if t is equal to time constant then _____

a) Speed increases to 36.8% of its initial value

b) Speed reduces to 36.8% of its initial value

c) Speed reduces to 26.8% of its initial value

d) Speed reduces to 46.8% of its initial value

View Answer

Answer: b

Explanation: While carrying out retardation test, speed of the motor decreases. At time t equal to time constant then speed reduced is given by 36.8% of its initial value. Retardation test result is used to determine initial slope of ω(t).

10. In retardation test _____

a) Motor switch is made ON and various speed readings are taken

b) At rated speed various speed readings are taken out at different times

c) Motor switch is made OFF at rated speed and various speed readings are taken

d) Some readings are taken while speed is building up and some readings while speed is lowering down

View Answer

Answer: c

Explanation: The motor is run to rated speed (or any high speed) and the supply is switched-off. As the motor decelerates (retards), several speed-time readings are taken, by a speedometer and watch with seconds hand. Initial readings are taken at small time intervals and the time interval is increased as the motor slows down.

11. Retardation curve is _____

a) Starting from origin

b) Starts from some positive value and increasing

c) Starts from some positive curve and stays constant

d) Starts from some positive value and decreases

View Answer

Answer: d

Explanation: Retardation curve is a plot of speed vs. time at various retarding speeds. Thus, curve starts at some positive value and shows exponentially decaying nature with time. From various values of speed we calculate windage and friction loss at each point.

This set of DC Machines Multiple Choice Questions & Answers (MCQs) focuses on "Hopkinson's Test".

1. Hopkinson's test of D.C. machines is conducted at _____

a) No-load

b) Part load

c) Full-load

d) Overload

View Answer

Answer: c

Explanation: Unlike Swinburne's test Hopkinson's test is carried out at loaded condition. Thus, we get stray load loss also, while finding out the efficiency. Hence, efficiency is not over-estimated like Swinburne's test.

2. Hopkinson's test requires _____

a) One DC machine on which test is carried out

b) Two different DC machines

c) Two identical DC machines

d) Can be worked with one or two machines

View Answer

Answer: c

Explanation: This is a regenerative test in which two identical dc shunt machines are coupled mechanically and tested simultaneously. One of the machines is used as a motor driving while the other one acts as a generator which supplies electric power to motor.

3. In Hopkinson's test, two machines are connected in _____

a) Series

b) Parallel

c) Can be connected in parallel or series

d) Two machines are not required

View Answer

Answer: b

Explanation: The two machines are made parallel by means of switch S after checking that similar polarities of the machine are connected across the switch. Here, one machine is driving another machine.

4. What will happen if field current of generator in Hopkinson's test is increased?

a) Current through motor armature will increase

b) Current through motor armature will decrease

c) Current through motor armature will remain constant

d) Motor armature current cannot be determined

View Answer

Answer: a

Explanation: If field current through generator is increased, back emf of generator will increase thus it'll become greater than back emf of a motor, so to compensate this effect armature current in generator will increase thus, motor armature current will also increase.

5. What will happen if field current of motor in Hopkinson's test is decreased?

a) Current through motor armature will increase

b) Current through motor armature will decrease

c) Current through motor armature will remain constant

d) Motor armature current can't be determined

View Answer

Answer: a

Explanation: If field current through motor is decreased, speed of the motor will increase due to inverse proportionality, back emf of generator will increase thus it'll become greater than back emf of a motor, so to compensate this effect armature current in generator will increase thus, motor armature current will also increase.

6. Hopkinson's test is a regenerative test.

a) True

b) False

View Answer

Answer: a

Explanation: Hopkinson's test is a regenerative test, because the power drawn from the mains is only that needed to supply losses. The test is, therefore, economical for long duration test like a "heat run".

7. For carrying out load test on Hopkinson's test setup _____

a) Actual load is needed

b) By changing field currents in two machines load can be changed

c) Can't carry out

d) By changing the armature current test is carried out

View Answer

Answer: b

Explanation: There is no need to arrange for actual load (loading resistors) which apart from the cost of energy consumed, would be prohibitive in size for large-size machines. By merely adjusting the field currents of the two machines, the load can be easily changed and a load test conducted over the complete load range in a short time.

8. Hopkinson's test gives _____

a) Combined iron losses of two machines which can be separated

b) Combined iron losses of two machines which can't be separated

c) Doesn't include iron losses

d) Depends on actual setup

View Answer

Answer: b

Explanation: From Hopkinson's test both machines are not loaded equally and this crucial in small machines. Thus, it is important to know the separate iron losses for given machines. But, test gives combined losses which are different for different machines as excitation differs.

9. Hopkinson's test is suitable for _____

a) Small machines only

b) Small and medium machines

c) All machines

d) Only large machines

View Answer

Answer: d

Explanation: A large variation of field currents is required for small machines, the full-load set speed is usually higher than the rated speed and the speed varies with load. The full load in small machines cannot obtained by cutting out all the external resistances present in the generator field. Sufficient reduction in the motor field current is necessary to achieve full-load conditions resulting in speeds greater than the rated value.

10. Why field test is conducted even if Hopkinson's test is present?

a) Instability of an operation

b) Possibility of run-away speed

c) Both instability and possibility of run-away speed

d) Field test is not conducted

View Answer

Answer: c

Explanation: Regenerative test on two identical series motors is not feasible because of instability of such an operation and the possibility of run-away speed. Therefore, we have toconduct a loading test.

11. In field's test generator field and motor field are connected in _____

a) Series

b) Parallel

c) Alternatively, series and parallel

d) Not connected

View Answer

Answer: a

Explanation: The generator field is connected in series with motor field circuit. The generator is thus separately excited and its excitation is identical to that of motor at all loads. This ensures that the iron-loss of both the machines are always equal.

UNIT-1

DC GENERATORS

1. List the factors involved in the voltage buildup of a Shunt Generator.
2. Define Winding factor.
3. Define residual EMF in DC Generator?
4. Define back pitch and front pitch.
5. Define winding pitch and commutator pitch.
6. Define Commutation and Commutation period.
7. Differentiate Lap winding and Wave Winding of a DC machine armature.
8. Discuss why the external characteristics of a DC Shunt Generator is more drooping than that of a separately excited.
9. Discuss the detail under which conditions a dc shunt generator fails to excite.
10. Discuss the purpose of yoke in dc machine.
11. Classify the different types of DC Generators based on method of excitation?
12. Demonstrate the armature reaction in DC Generators? What are its effects?
13. Illustrate a schematic diagram indicating flow of energy in the conversion of Mechanical Energy into Electrical Energy.
14. Explain in short the role of inter poles in DC Machines.
15. Pointout why the air gap between the pole pieces and the armature is kept very small?
16. Explain in short the Commutation and Commutation period.
17. Integrate the Characteristics of all DC Generators in single graph.
18. Summarize the application of various types of Generators.
19. Generalize the requirements of the excitation systems?
20. Develop critical resistance of a dc shunt generator.

Descriptive question

1. Draw and Explain the Load Characteristics of Differentially and Cumulatively Compound DC Generator.
2. A 4 pole DC Shunt Generator with lap connected armature supplies 5 kilowatt at 230 Volts. The armature and field copper losses are 360 Watts and 200 Watts respectively. Calculate the armature current and generated EMF?
3. A separately excited generator when running at 1000rpm supplied 200A at 125V. What will be the load current when the speed drops to 800rpm if If is unchanged? Given that armature resistance=0.04Ωand brush drop=2V. Derive the necessary equations.
4. In a 400 volts, DC Compound Generator, the resistance of the armature, series and shunt windings are 10 ohm, 0.05 ohm and 100 ohms respectively. The machine supplies power to 20 Nos. resistive heaters, each rated 500 watts, 400 volts. Identify the induced emf and

armature currents when the generator is connected in (1) Short Shunt (2) Long Shunt. Allow brush contact drop of 2 volts per brush.

5. Explain the armature reaction and commutation in detail for a DC Machine
6. Draw and explain the OCC Characteristics and External Characteristics of DC Generator.
7. With neat sketch explain the construction and principle of operation of DC Generator
8. A 6-pole DC Generator has 150 slots. Each slot has 8 conductors and each conductor has resistance of 0.01Ω. The armature terminal current is 15 A. Calculate the current per conductor and the drop in armature for Lap and Wave winding connections
9. Show the condition for maximum efficiency of the DC Generator
10. Calculate the emf induced in the armature of a two pole generator whose armature has 280 conductors and is revolving at 1000 rpm. The flux per pole is 0.03 Weber.
11. Calculate the generated emf of a DC Generator which has 4 poles total number of conductors equal to 256 Lap wound running at 2000 rpm. The useful flux per pole is 0.2 Weber
12. Explain in detail about commutation and list out the various methods of improving commutation in detail with a neat sketch
13. Derive an expression for the EMF Equation of DC Generator
14. The lap wound armature has a 4-pole generator has 51 slots. Each slot contains 20 conductors. What will be the emf generated in machine when driven at 1500 rpm. If useful flux per pole is 0.01 Wb?
15. A 12 pole DC Generator has a simple wave wound armature containing 144 coils of 10 turns each. The resistance of each turn is 0.01 ohm. Its flux per pole is 0.05 Weber and it is running at a speed of 200 rpm. Obtain the induced armature voltage and the effective resistance.
16. Explain the different methods of excitation and characteristics of DC Generators with suitable diagram.
17. Explain the following constructional components of DC Machine (i) Magnetic Frame or Yoke (ii) Pole Core (iii) Field Coils (iv) Armature (v) Armature Winding (vi) Commutator (vii) Brushes and Bearings.
18. Explain the effect of armature reaction in a dc generator. How are its demagnetizing and cross magnetizing calculated.
19. A four pole lap wounded shunt generator supplies 60 lamps of 100W, 240V each; the field and armature resistances are 55ohm and 0.18ohm respectively. If the brush drop is 1volt for each brush formulate (i) armature current (ii) current per path (iii) generated emf (iv) power output of dc machine
20. In Armature Reaction Explain the following terms (i) Main field of DC Machine (ii) Armature Field of DC Machine (iii) Interaction between a main field and armature mmf (iv) Armature conductor and Ampere Turns

21. In commutation Explain the following terms (i) Mechanical Cause of Commutation (ii) Electrical cause of commutation (iii) Process of commutation (iv) Methods to improve commutation.
22. Explain the following terms in DC Generator (a) Lap and Wave Winding (b) Compensation Winding.

Unit-2

DC MOTORS

1. Define Back emf in a D.C. Motor?
2. List the application of various types of DC Motor.
3. List the merits and demerits of Swinburne's test.
4. Define Speed regulation of DC Motor.
5. Define Fleming's left hand rule
6. When you will say the motor is running at base speed?
7. Summarize the different techniques used to control the speed of DC Shunt motor.
8. Describe the torque equation of a DC Motor.
9. Give the advantages and disadvantages of Flux control method?
10. Express the voltage equation of DC Motor.
11. Demonstrate How to reverse the direction of rotation of DC Motor?
12. Show at what load does the efficiency is maximum in DC Shunt Machines.
13. Illustrate the circuit model of various types of motors.
14. Point out why the Starters necessary for starting DC Motors?
15. What will happen to the speed of a dc motor when its flux approaches to zero?
16. Explain why Swinburne's test cannot be performed on DC Series Motor.
17. Criticize "belt drive not suitable for DC Series Motor why?"
18. Explain the significance of back emf in a DC Motor?
19. Explain the function of no-volt release in a Three- point starter?
20. Mention the effects of differential compounding and cumulatively compound on the performance of DC Compound motor

. **Descriptive question**

1. With neat diagram explain the principle, construction and working of DC Motor.
2. Describe briefly the various methods of controlling the speed of a DC Shunt Motor and bring out their merits and demerits. Also, state the situations where each method is suitable.
3. Describe Plugging, dynamic and regenerative braking in DC Motor.
4. A 230 volts DC Shunt motor on no-load runs at a speed of 1200RPM and draw a current of 4.5 Amperes. The armature and shunt field resistances are 0.3 ohm and 230 ohms respectively. Calculate the back EMF induced and speed, when loaded and drawing a current of 36 Amperes.

5. Discuss why starting current is high at the moment of starting a DC Motor? Explain the method of limiting the starting current in DC Motors and also.
6. With neat sketch explain three point starter to start the DC Shunt Motor.
7. A DC Series Motor runs at 500 rpm on 220 V supply drawing a current of50 A. The total resistance of the machine is 0.15Ω, calculate the value of the extra resistance to be connected in series with the motor circuit that will reduce the speed to 300 rpm. The load torque being then half of the previous to the current.
8. A 500V DC Shunt Motor running at 700 rpm takes an armature current of50A.Its effective armature resistance is 0.4Ω. What resistance must be placed in series with the armature to reduce the speed to 600 rpm, the torque remaining constant?
9. Explain briefly the merits and demerits of Hopkinson's test?
10. Explain the different methods of excitation and characteristics of a DC Motors with suitable diagrams
11. A 400 Volts DC Shunt Motor has a no load speed of 1450 RPM, the line current being 9 Amperes. At full loaded condition, the line current is 75 Amperes. If the shunt field resistance is 200 Ohms and armature resistance is 0.5Ohm. Evaluate the full load speed.
12. With the help of neat circuit diagram, explain swineburne's test and derive the relations for efficiency (Both for generator and Motor).
13. A 4pole DC series motor has 944 wave connected armature conductors. At a particular load, the flux per pole is 0.04wb and the total torque developed is 260 N-m. Calculate the line current taken by the motor and the speed at which it will run with an applied voltage of 500V. The total motor resistance is 3Ω.
14. Explain the construction, principle, working and equivalent circuit of PMDC Motor.
15. Generalise the following tests in DC Motor (i)Retardation Test (ii)Swinburne's Test (iii) Hopkinson's Test.
16. In DC Motor with neat diagram explain the terms (i) Principle of Operation (ii) Construction of DC Machine
17. In DC Motor explain the speed versus torque characteristics of DC Motor (i) DC Series Motor (ii) DC Shunt Motor
18. What is meant by Braking of Electric Motor? Explain the following types of Electrical Braking (i) Regenerative Braking (ii) Dynamic or Rheostatic Braking (iii) Plugging or Reverse Braking
19. Explain the different methods for speed control of DC Motor (i) Armature Control (ii) Field Control
20. In a Hopkinson's test on a pair of 500V, 100kW shunt generators, the following data was obtained: Auxiliary supply: 30A at 500V Generator output current: 200A Field Currents: 3.5A (Generator) and 1.8A (Motor). Armature circuit resistances: 0.075Ω each machine. Voltage drop at the brushes: 2V (each machine). Calculate the efficiency of the machine acting as a generator

21. A 10KW,240V dc shunt motor draws a line current of 5.2 amps while running at no load of 1200rpm from a 240V dc supply. It has an armature resistance of 0.25 ohms and field resistance of 160 ohms . Estimate the efficiency of motor when it delivers rated load.
22. In a brake test the efficiency load on the branch pulley was 40Kg, the effective diameter of the pulley 73.5 cm and speed 15 rps. The motor takes 60A at 230V. Calculate the output power and efficiency at this load.
23. A 480 V, 20kW, shunt motor of rows 2.5A, when running at with light load .Taking the armature resistance to be 0.6Ω,field resistance to be 800 Ω and brush drops at 2V and find full load efficiency.

UNIT – III

Methods of Testing

1. Mention the various losses that occur in DC machines?
2. Write down mechanical efficiency and electrical efficiency expressions in terms of Eg & Ia, for DC generator?
3. What is the condition for maximum efficiency of any DC machine?
4. What do you understand by Swinburne‟s test and what are its limitations?
5. On which factors Eddy current and Hysteresis losses are depends?
6. Does core loss occur in armature or in the poles of DC machine?
7. Which type of mechanical losses occurs in a DC machine?
8. If Pc and Ps is the full – load copper loss and stray power losses (including iron loss) of DC machine for which value of the ratio Pc/Ps will be the maximum efficiency occur at 80% offull – load?
9. Briefly explain with reason whether the field test on two identical DC series machines in generative method?
10. At which point of a conductor embedded in a slot does the maximum temperature occur?

Descriptive question

1. Explain the experimental procedure to conduct „Retardation Test‟ on a dc shunt machine with the help of connection diagram. How the different losses are estimated from the test results?
2. With neat circuit diagram, explain the procedure to conduct Swinburne‟s test.
3. List the calculations to be made to predetermine the efficiency of DC motor by using Swinburne‟s test results.
4. Derive the expression for condition for maximum efficiency.
5. Explain how many losses are there in dc machine with equations.
6. Explain the procedure to conduct Hopkinson‟s test with neat sketches.
7. Explain the procedure separate the losses in dc machine with neat sketches.
8. Classify the methods of testing? And compare them.
9. Indirect test is superior to the direct test justify this statement with proof.
10. With neat circuit diagram Calculate the efficiency by break test.
11. Draw and explain the internal and external characteristics of dc motor.
12. A 250 V, 15 kw, shunt motor has a maximum efficiency of 88% and a speed of 700 r.p.m., when delivering 80% of its rated output. The resistance of its shunt field is 100Ω. Determine the efficiency and speed when the motor draws a current of78 A from the mains.
13. A 10 kw, 250 V d.c. shunt generator has a total load rotational loss of400 watts. The armature circuit and shunt field resistances are 0.5 ohm and 250 ohm respectively.

Calculate the shaft power input and the efficiency at rated load. Also calculate the maximum efficiency and the corresponding power output.

14. A 10 kw, 240 V d.c. shunt motor draws a line current of5.2 A while running at no load speed of 1200 r.p.m. from a 240 V d.c. supply. It has an armature resistance of 0.25Ω and a field resistance of 160Ω. Estimate the efficiency of the motor when it delivers rated load
15. Two identical d.c. shunt machines when tested by Hopkinson‟s method, gave the following data:
    Line voltage 230 V; line current excluding both the field current 30 A ; motor armature current 230 A, field currents 5 A and 4 A Ifthe armature resistance of each machine is 0.025 ohm, calculate efficiency of both the machines.
16. Hopkinson‟s test on two similar d.c. shunt machine gave the following data: Line voltage 230 V; line current excluding both the field currents, 40 A ; motor armature current 350 A; field currents 5 A and 4.2 A.
17. A 230 V d.c. shunt motor takes 5 A when running at no load. The armature resistance is 0.2 ohm and field circuit resistance is 115 ohm. For an input current of 72 A, calculate the shaft output and efficiency. Also calculate the armature current at which the efficiency is maximum
18. A 100 V series motor takes 45 A when running at 750 rpm. Its armature resistance is 0.22 ohm & series field resistance is 0.13 ohm, iron & friction losses amount to 750 W, find i) shaft power ii) total torque & iii) shaft torque.
19. A 220 V, 3.7KW dc motor operates at full load with 90% efficiency has constant losses 180W. Find the copper loss at full load. Also find the efficiency of motor at half full load.
20. The armature and field resistances of a 300 V, dc shunt motor are 0.6 Ω and 260 Ω respectively.When driving a load of constant torque at 600 rpm, the armature current is 25 A. If it is required to increase the speed from 600 rpm to 750 rpm, calculate the resistance to be connected in the shunt field circuit.

UNIT IV

TRANSFORMERS

1. List out the merits and demerits of core and shell type transformer.
2. How do you reduce leakage flux in a transformer?
3. Show the no load phasor diagram of a transformer.
4. What happens if DC supply is applied to the transformer? B
5. Give the principle of transformer.
6. List the losses in a transformer?
7. The emf per turn for a single-phase 2200/220V, 50 Hz transformer is 11 V. Calculate the number of primary and secondary turns.
8. Describe turns ratio of transformer.
9. Why is transformer rated in KVA? Justify
10. Explain ideal transformer and draw its phasor diagram?
11. Compose the advantages and applications of auto transformer.
12. Differentiate two winding transformer and auto transformer.
13. Give any four three phase transformer connections.
14. Deduce the regulation of a transformer.
15. Predict the causes of stray losses?
16. Show the condition for parallel operation of a transformer?
17. Compose the purpose of conducting open circuit test?
18. Describe the role of tertiary winding in Transformer.
19. Define all day efficiency. Explain why all day efficiency is lower than commercial efficiency?
20. Interpret the Inrush current in a transformer

Descriptive question

1. Explain the principle of operation of a transformer. Derive its emf equation
2. The voltage per turn of a single phase transformer is 1.1 volt, when the primary winding is connected to a 220 volt, 50 Hz AC supply the secondary voltage is found to be 550 volt. Identify the primary and secondary turns and core area if maximum flux density is 1.1 Tesla
3. Calculate the efficiency for half, full load of a 100KVA transformer for the P.F of unity and 0.8, the copper loss at full load is 1000W and iron loss is 1000W
4. Develop the equivalent circuit of a single phase transformer referred to primary and secondary.

5. Draw and explain the phasor diagram of transformer when it is operating under load.
6. Explain the construction and working of core type and shell type transformers with neat sketches.
7. A 500 KVA Transformer has a core loss of 2200 watts and a full load copper loss of 7500 watts. If the power factor of the load is 0.90 lagging, Evaluate the full load efficiency and the KVA load at which maximum efficiency occurs
8. Derive an expression for maximum efficiency of a transformer.
9. A 500KVA transformer has 95% efficiency at full load and also at 60% of full load both at UPF. a) Separate out the transformer losses. b) Measure the transformer efficiency 75% full load, UPF.
10. Obtain the generalised conditions for parallel operation of Transformer. Also explain the effect of load sharing due to impedance variation between transformers during parallel operation
11. A 100 KVA, 3300 V/240 V, 50 HZ single phase transformer has 990 turns on the primary. Identify the number of turns on secondary and the approximate value of primary and secondary full load currents.
12. A single phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233 and 0.067. Calculate the equivalent resistance of a) the primary in terms of the secondary winding b) the secondary in terms of the primary winding c) the total resistance of the transformer in terms of the primary
13. Explain the back to back method of testing for two identical single phase transformers
14. Obtain the equivalent circuit of a 200/400V 50 Hz single phase transformer from the following test data. O.C.test: 200V, 0.7A, 70W – on L .V Side S.C. test: 15V, 10A, 85W – on H.V side Calculate the secondary voltage when delivering 5 kW at 0.8 p.f. lagging. The primary voltage being 200V
15. Describe the method of calculating the regulation and efficiency of a single phase transformer by OC and SC tests?
16. Evaluate in brief the voltage regulation with necessary expressions.
17. Obtain the equivalent circuit of a 200/400V 50 Hz single phase transformer from the following test data. O.C.test: 1100V, 0.5A, 55W – on primary Side, secondary being open circuited S.C. test: 10V, 80A, 400 W – on LV side, high voltage side being short circuited. Calculate the voltage regulation and efficiency for the above transformer when supplying 100A at 0.8 p.f. lagging.
18. Explain the operation of a transformer with necessary vector diagrams. (i) On no load and (ii) On load with UPF, leading and lagging power factors
19. The primary of the transformer is rated at 10A and 1000V. The open circuit reading are V1=1000V, V2=500V, I=.42A, Pac=100W. The short circuit readings are I1=10A,V1=125V and Pac=400W. Draw the equivalent circuit for the transformer. Predict the ouput voltage for the load impedance ZL=19+j12ohms and draw the phasor diagram

20. A 75KVA transformer has 500 turns' primary and 100 turns secondary. The primary and secondary resistances are 0.4 ohm and 0.02ohm respectively and the corresponding leakage reactances are 1.5ohm and 0.045ohm respectively. The supply voltage is 2200V, evaluate (a) equivalent impedance referred to primary circuit and (b) voltage regulation and secondary terminal voltage for full load load at power factor of (i) 0.8 lagging and (ii) 0.8 leading

UNIT V

OC AND SC TESTS

1. What is an auto transformer?
2. A 3-phase transformer over a bank of 3-single phase transformers of equal rating, has the advantage of what?
3. The percentage capacity of V-V bank compared to delta – delta is?
4. Draw the circuit connection of Delta-Delta.
5. Draw the circuit connection of Scott Connection.
6. Write about star-star connection in a three a phase transformer.
7. Write about delta-star connection in a three a phase transformer.
8. What are the advantages of Three-phase Transformers?
9. List out at least two essential factors for production of noise in a transformer.
10. If the polarity of one of the transformer is reversed on a delta bank of single phase transformers that are connected for three phase operation, what would be the result?

Descriptive question

1. A11000/230 V,150 KVA ,1-phase ,50 Hz transformer has core loss of 1.4kW and F.L cu loss of 1.6 Kw .determine (i)The kVA load for maximum efficiency and the value of maximum efficiency at unity p.f (ii) The efficiency at half F.L 0.8 pf leading
2. Data of a 500KVA, 3300/400 V, 50 Hz, single phase transformer is given below.
   S.C test: 1250 W, 100 V secondary short circuited with full load current in it

   O.C test: 1000 W with normal primary voltage.

   Calculate the full load regulation and efficiency at a power factor of 0.8(lag)

3. The maximum efficiency of a single phase 250kVA,2000/250 V transformer occurs at 80% of full load and is equal to 97.5% at 0.8 pf .determine the efficiency and regulation on full load at 0.8pf lagging if the impedance of the transformer is 9 percent
4. Calculate the short-circuit parameters of a three-phase transformer with the following nominal parameters: apparent power Sn = 2.4 MVA, fn = 50 Hz, primary voltage (HV) $V1n$ = 35 kV, no-load current $i0\%$ = 5.0%, short-circuit voltage $vsc\%$ = 6.5%. The winding connection is Yd11 and the short-circuit power is Psc = 26 kW.
5. The parameters of the equivalent circuit of a 150-kVA, 2400-V/240-V transformers are: $R1$ = 0.2 Ω, $R2$ = 0.002 Ω, $X1$ = 0.45 Ω, $RF\ e$ = 10 kΩ, Xm = 1555 Ω. On the basis of the

equivalent circuit shown in Fig. calculate: voltage regulation $\Delta v\%$; efficiency of the transformer operating at rated load with 0.8 lagging power factor.

6. A single-phase transformer has the following nominal parameters: apparent power Sn = 15 kVA, primary voltage $V1n$ = 600 V, secondary voltage $V2n$ = 240 V, no-load power $p\%$ = 1.2%, no-load current $i0\%$ = 6.2%, short-circuit power $psc\%$ = 3.5%, short-circuit voltage $vsc\%$ = 5.5%, frequency fn = 50 Hz. The hysteresis losses $\Delta Ph = 3\Delta Pe$, where ΔPe are eddy-current losses. Calculate: (a) parameters of the equivalent circuit; (b) no-load losses, no-load current and power factor when the primary winding is fed with the voltage of 720 V and frequency 60 Hz.
7. Explain the various three phase transformer connections and parallel operation of three phase transformer.
8. The following data were obtained on a 20 kVA, 50 Hz, 2000 / 200 V distribution transformer:

	Voltage	Current	Power
OC test with HV open	200	4	120
SC test with LV short	60	10	300

Draw the approximate equivalent circuit of the transformer referred to the HV and LV sides respectively.

9. With circuit, explain Sumpner's test and how to obtain efficiency of a transformer?
10. Describe the method of calculating the regulation and efficiency of a single phase transformer by OC and SC tests.
11. Specify the condition for parallel operation of transformer. Also explain the effect of load sharing due to impedance variation between transformers during parallel operation.
12. A 100 kVA, 3300 V/240 V, 50 Hz, single phase transformer has 990 turns on the primary. Calculate the number of turns on secondary and approximate value of primary and secondary full load currents.
13. What is meant by inrush current in transformer? Specify the nature of inrush currents and its problem during transformer charging.
14. A 500 kVA transformer has a core loss of 2200 W and a full load copper loss of 7500 W. If the power factor of the load is 0.9 lagging, calculate the full load efficiency and the kVA load at which maximum efficiency occurs.
15. Obtain the equivalent circuit of a 200 / 400 V, 50 Hz, 1 phase transformer from the following test data:

    O.C. test: 200 V, 0.7 A, 70 W – on L.V side.

    S.C. test: 15 V, 10 A, 85 W – on H.V side.

    Calculate the secondary voltage when delivering 5 kWat 0.8 p.f lagging, the primary voltage being 200 V.

16. A 3 phase step down transformer is connected to 6.6 kV mains and takes 10 A. Calculate the secondary line voltage and line current for the (i) Δ/Δ (ii) Y/Y (iii) Δ/Y (iv) Y/Δ connections. The ratio of turns per phase is 12 and neglect no load losses.
17. Explain the reasons for "tap changing" in transformers. State on which winding the taps are provided and why?
18. A transformer has its maximum efficiency of 0.98 at 15 kVA at UPF. During the day it is loaded as follows:

12 hours	2 kW	at 0.5 p.f
6 hours	12 kW	at 0.8 p.f
4 hours	18 kW	at 0.9 p.f
2 hours	No load	

Find the "All Day Efficiency".

NETWORK THEORY

PROGRAMME: B.Tech EEE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **NETWORK THEORY**	SEMESTER: **I** CREDITS: 4 COURSE COORDINATOR: DR. R. DEVASARAN
COURSE CODE: EE304ES REGULATION:**R16**	COURSE TYPE: **Core**
COURSE AREA/DOMAIN: EEE	CONTACT HOURS: 4 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

BRIEF NOTE ON THE IMPORTANTANCE OF THE COURSE AND HOW IT FITS IN TO THE CURRICULAM

After going through this course the student gets a thorough knowledge on, Magnetic circuits, network topology, three phase circuits, transients in electrical systems, network parameter of given electrical network and filter configuration with which he/she can able to apply the above Conceptual things to real-world electrical and electronics problems and applications.

PREREQUISITES, IF ANY

- Basic electrical engineering
- AC circuits

MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
There shall be two mid tem examinations. Each Mid-term exam consists of subjective type and objective type test. The subjective test is for 10 marks, with duration of 1 hour Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks. The student is assessed by giving two assignments, one, after completion of 1to 2 1/2 units and the second, after the completion of 2 1/2 to 5 units each carrying 5 marks. On the total the internal marks are 25. The average of two internal tests is the final internal marks. The external question paper is set by JNTUH consisting of part –A and part- B. Where part consists	75	100

of short answer questions carrying total marks of 25 and part part-B consists of 5 essay type questions consists of internal choice each carrying 10 marks and the total of 50. The total external marks are 75.awarded considering the average of two assignments in each course		

EVALUATION SCHEME:

S.No	Component	Total Duration	Marks
1.	I Mid Examination	90 Minutes	20
2.	I Assignment	----	05
3.	II Mid Examination	90 Minutes	20
4.	II Assignment	------	05
5.	External Examination	3 hours	75

Course Objectives:

1. To understand Magnetic Circuits, Network Topologyand Three phase circuits.
2. To analyze transients in Electrical systems.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations

Course Outcomes:

After this course, the student will be able to

- Analyze the Electrical Circuits with the concept of Network topology
- Apply the concepts of Magnetic circuit & Analyze Magnetic circuits

- Determine self and mutually induced EMF's for Magnetically coupled coils
- Understand the importance of three phase circuits and Analyze the three phase circuits with Star & Delta connected balanced and unbalanced loads
- Analyze the transient behavior of electrical networks for various excitations
- Obtain the various network parameters for the given two port networks
- Represent the transfer function for the given network
- Determine the parameters for the design of various filters

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

II Year B.Tech EEE I-Sem	T	P	C
	4+1*	0	4

NETWORK THEORY

Objectives

5. To understand Magnetic Circuits, Network Topologyand Three phase circuits.
6. To analyze transients in Electrical systems.
7. To evaluate Network parameters of given Electrical network
8. To design basic filter configurations

UNIT – I Magnetic Circuits: Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit – Analysis of series and parallel magnetic circuits Network topology: Definitions– Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.

UNIT – II Three phase circuits: Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced
3 phase circuits – Measurement of active and reactive power.

UNIT – III Transient Analysis: Transient response of R-L, R-C, R-L-C circuits (Series and Parallel
combinations) for D.C. and sinusoidal excitations – Initial conditions – Classical method and Laplace transforms methods of solutions. Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

UNIT – IV Network Parameters: Network functions driving point and transfer impedance function
networks- poles and zeros –necessary conditions for driving point function and for transfer function Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations– 2- port network parameters using transformed variables.

UNIT – V Filters: Introduction to filters –low pass – high pass and band pass – RC, RL, filters- constant K and m derived filters and composite filter design

TEXT BOOKS

- "William Hayt and Jack E. Kemmerly", "Engineering circuit analysis", Mc Graw Hill Company, 6th edition, 2016.
- "D. Roy Chowdary", "Networks and systems", New age international publishers, 2009.
- "N. C. Jagan & C. Lakshminarayana", "Network Theory", B.S Publications, 2014.
- "A. Chakrabarthy", Circuit Theory, Dhanpat Rai, 2005.

REFERENCE BOOKS:

- "Van Valkenburg", "Network Analysis", PHI, 3rd Edition, 2014
- "Franklin F Kuo," "Network Analysis & Synthesis", Wiley India PVT. Ltd., second Edition, 2006
- "K.C. A. Smith & R. E. Alley", "Electrical Circuits", Cambridge University Press, 1992
- "K. Rajeswaran", "Electric Circuit theory", Pearson Education, 2004.

"A. Bruce Carlson", "Circuits", Thomson Publishers, 1999.

COURSE PLAN:

S. No	Unit No	Topic	No of sessions planned	Mode of teaching BB/PPT/ OHP/MM	Reference *	Remarks
1	I	Faraday's laws of electromagnetic induction	1	BB	A1,B1	
2		Concept of self and mutual inductance	1	BB	A1,B1	
3		Dot convention	2	BB	A1,B1	
4		Coefficient of coupling- composite magnetic circuit- Analysis of series and parallel magnetic circuits	1	BB	A1,B1	
5		Definitions- Graphs- Tree	2	BB	A1,B1	
6		Basic cutest and basic tie set matrices for planar networks	1	BB	A1,B1	
7		Loop and nodal methods	2	BB	A1,B1	
8		Analysis of networks with dependent	1	BB	A1,B1	
		Independent voltage and current sources				
		Duality and dual networks				
9	II	Phase sequence	2	**PPT**	A1,B1	
10		Star and delta connection	1	BB	A1,B1	
11		Relation between line and phase voltages and currents in balanced systems	1	BB	A1,B1	
12		Analysis of balanced and unbalanced 3 phase circuits	1	BB	A1,B1	
13		Measurement of active and reactive power	1	**PPT**	A1,B1	

14		Problems	1	BB	A1,C1	
15	III	Transient response of R-L	1	BB	A1,C1	
16		R-C	2	**PPT**	A1,C1	
17		R-L-C circuits	2	**PPT**	A1,C1	
18		(Series and parallel combinations) for D.C. and sinusoidal excitations	2	**PPT**	A1,C1	
19		Initial conditions	1	BB	A1,C1	
20		Classical method and Laplace transforms methods of solutions	1	BB	A1,C1	
21		Measurement of high voltage alternating and impulse	2	BB	A1,C1	
22		Direct alternating and impulse	2	BB	A1,C1	
23		Oscilloscope for impulse voltage	2	BB	A1,C1	
24		Current measurements	1	BB	A1,C1	
25		Transient response of the above circuits for different inputs such as step	1	BB	A1	
26		Ramp	1	BB	A1	
27		Pulse and impulse by using Laplace transforms method	2	BB	A1	
28						
29						
30		Problems	1	BB	A1	
31	IV	Network functions				
32		driving point and transfer	1	BB	A1	

		impedance function networks-				
33		poles and zeros	1	BB	A1	
34		Z Parameters	2	BB	A1	
35		Y Parameters	2	BB	A1	
36		. ABCD Parameters	1	BB	A1	
37		Hybrid parameters and their relations	1	BB	A1	
38		2-port network parameters using transformed variables.	1	BB	A1	
39						
40						
41						
42	V	Introduction to filters				
43		low pass	1	BB	A1	
44		high pass	1	BB	A1	
45		band pass	1	BB	A1	
46		RC	1	BB	A1	
47		RL	1	BB	A1	
48		Filters	1	BB	A1	
49		Constant K and m derives filters	1	BB	A1	
50		Composite filter design	1			

TEXT BOOKS

- "William Hayt and Jack E. Kemmerly", "Engineering circuit analysis", Mc Graw Hill Company, 6th edition, 2016.
- "D. Roy Chowdary", "Networks and systems", New age international publishers, 2009.
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- "K. Rajeswaran", "Electric Circuit theory", Pearson Education, 2004.
- "A. Bruce Carlson", "Circuits", Thomson Publishers, 1999

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Objective	Course Outcomes				
	a	**b**	**c**	**d**	**e**
I	S				
II	S		S		
III			H		
IV				H	S

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES

Course Outcomes	Program Outcomes													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
a	S													
b	S	S									S		S	S

c	S	S												
d		S					S				S		H	S
e	S		S		S		S				S		S	
f	**S**			**S**						**S**			**S**	
g	**S**			**S**						**S**			**S**	
h		**S**		**S**			**S**							**S**

QUESTION BANK

UNIT-1

1. Ohm's law for magnetic circuits is _____

a) $F=\phi S$

b) $F=\phi/S$

c) $F=\phi^2 S$

d) $F=\phi/S^2$

View Answer

Answer: a
Explanation: Ohm's law for magnetic circuits states that the MMF is directly proportional to the magnetic flux where reluctance is the constant of proportionality.

2. What happens to the MMF when the magnetic flux decreases?
a) Increases
b) Decreases
c) Remains constant
d) Becomes zero
View Answer

Answer: b
Explanation: Ohm's law for magnetic circuit's states that the MMF is directly proportional to the magnetic flux hence as the magnetic flux decreases, the MMF also decreases.

3. Calculate the MMF when the magnetic flux is 5Wb and the reluctance is 3A/Wb.
a) 10At
b) 10N
c) 15N
d) 15At
View Answer

Answer: d
Explanation: We know that:
$F=\phi S$
Substituting the given values from the question, we get MMF= 15At.

4. A ring having a cross-sectional area of 500 mm^2, a circumference of 400 mm and ϕ=800microWb has a coil of 200 turns wound around it. Calculate the flux density of the ring.
a) 1.6T
b) 2.6T
c) 3.6T
d) 4.6T
View Answer

Answer: a
Explanation: From the given question:
Flux density= $800*10^{-6}/500*10^{6}=1.6$ Wb/m^2.

5. A ring having a cross-sectional area of 500 mm^2, a circumference of and ϕ=800microWb 400 mm has a coil of 200 turns wound around it. Calculate the reluctance.
a) $1.68 * 10^{-4}$A/Wb
b) $1.68 * 10^{4}$ A/Wb

c) $1.68 * 10^6$ A/Wb

d) $1.68 * 10^{-6}$A/Wb

View Answer

Answer: c
Explanation: From the given question:
Flux density= $800*10^{-6}/500*10^6$=1.6 Wb/m^2.
Reluctance= $0.4/(380*4*pi*10^{-7}*10^{-4}*5)$=$1.68 * 10^6$ A/Wb.

6. A ring having a cross-sectional area of 500 mm2, a circumference of 400 mm and ϕ=800microWb has a coil of 200 turns wound around it. Calculate the magnetomotive force.

a) 1442At

b) 1342At

c) 1432At

d) 1344At

View Answer

Answer: b
Explanation: We know that:
F=ϕS
Substituting the given values from the question, we get F= 1342At.

7. A ring having a cross-sectional area of 500 mm2 , a circumference of 400 mm and ϕ=800microWb has a coil of 200 turns wound around it. Calculate the magnetising current.

a) 6.7A

b) 7.7A

c) 7.6

d) 6.1A

View Answer

Answer: a
Explanation: We know that:
F=ϕS
Substituting the given values from the question, we get F= 1342At.
The magnetic current is:
I=F/N
Substituting the values from the question, we get I=6.7A.

8. Can we apply Kirchhoff's was to magnetic circuits?

a) Yes

b) No

c) Depends on the circuit

d) Insufficient information provided

View Answer

Answer: a

Explanation: Magnetic circuits have an equivalent to the potential difference of electric circuits. This is the magnetic potential difference which allows us to apply Kirchhoff's laws to magnetic circuit analysis.

9. What is MMF?

a) Magnetic Machine Force

b) Magnetomotive Force

c) Magnetic Motion Force

d) Magnetomotion Force

View Answer

Answer: b

Explanation: MMF stands for magnetomotive force. It is the sum of the magnetizing forces along a circuit.

10. The equivalent of the current I in magnetic ohm's law is?

a) Flux

b) Reluctance

c) MMF

d) Resistance

View Answer

Answer: a

Explanation: The equivalent of current in magnetic ohm's law is flux as:
V=IR is equivalent to $F=\phi S$.

UNIT-2

1. In a balanced three-phase system-delta load, if we assume the line voltage is $V_{RY} = V\angle 0^0$ as a reference phasor. Then the source voltage V_{YB} is?
a) $V\angle 0^0$
b) $V\angle -120^0$
c) $V\angle 120^0$
d) $V\angle 240^0$
View Answer

Answer: b
Explanation: As the line voltage $V_{RY} = V\angle 0^0$ is taken as a reference phasor. Then the source voltage V_{YB} is $V\angle -120^0$.

2. In the question 1, the source voltage V_{BR} is?
a) $V\angle 120^0$
b) $V\angle 240^0$
c) $V\angle -240^0$
d) $V\angle -120^0$
View Answer

Answer: c
Explanation: As the line voltage $V_{RY} = V\angle 0^0$ is taken as a reference phasor. Then the source voltage V_{BR} is $V\angle -240^0$.

3. In a delta-connected load, the relation between line voltage and the phase voltage is?
a) line voltage > phase voltage
b) line voltage < phase voltage
c) line voltage = phase voltage
d) line voltage >= phase voltage
View Answer

Answer: c
Explanation: In a delta-connected load, the relation between line voltage and the phase voltage is line voltage = phase voltage.

4. If the load impedance is Z∠Ø, the current (I_R) is?
a) (V/Z)∠-Ø
b) (V/Z)∠Ø
c) (V/Z)∠90-Ø
d) (V/Z)∠-90+Ø
View Answer

Answer: a
Explanation: As the load impedance is Z∠Ø, the current flows in the three load impedances and the current flowing in the R impedance is $I_R = V_{BR}\angle 0^0/Z\angle Ø = (V/Z)\angle -Ø$.

5. In the question 4, the expression obtained for current (I_Y) is?
a) (V/Z)∠-120+Ø
b) (V/Z)∠120-Ø
c) (V/Z)∠120+Ø
d) (V/Z)∠-120-Ø
View Answer

Answer: d
Explanation: As the load impedance is Z∠Ø, the current flows in the three load impedances and the current flowing in the Y impedance is $I_Y = V_{YB}\angle 120^0/Z\angle Ø = (V/Z)\angle -120-Ø$.

6. In the question 4, the expression obtained for current (I_B) is?
a) (V/Z)∠-240+Ø
b) (V/Z)∠-240-Ø
c) (V/Z)∠240-Ø
d) (V/Z)∠240+Ø
View Answer

Answer: b
Explanation: As the load impedance is Z∠Ø, the current flows in the three load impedances and the current flowing in the B impedance is $I_B = V_{BR}\angle 240^0/Z\angle Ø = (V/Z)\angle -240-Ø$.

7. A three phase, balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_R . Assume the phase sequence to be R_{YB}.
a) $44.74\angle -63.4^0$A
b) $44.74\angle 63.4^0$A
c) $45.74\angle -63.4^0$A
d) $45.74\angle 63.4^0$A
View Answer

Answer: a
Explanation: Taking the line voltage $V_{RY} = V\angle 0^0$ as a reference $V_{RY} = 400\angle 0^0$V, $V_{YB} = 400\angle -120^0$V and $V_{BR} = 400\angle -240^0$V. Impedance per phase = (4+j8) Ω = $8.94\angle 63.4^0$Ω. Phase current $I_R = (400\angle 0^o)/(8.94\angle 63.4^o) = 44.74\angle -63.4^0$A.

8. In the question 7, determine the phase current I_Y.
a) $44.74\angle 183.4^0$A
b) $45.74\angle 183.4^0$A
c) $44.74\angle 183.4^0$A
d) $45.74\angle -183.4^0$A
View Answer

Answer: c
Explanation: Taking the line voltage $V_{RY} = V\angle 0^0$ as a reference $V_{RY} = 400\angle 0^0$V, $V_{YB} = 400\angle -120^0$V and $V_{BR} = 400\angle -240^0$V. Impedance per phase = (4+j8)Ω = $8.94\angle 63.4^0$Ω. Phase current $I_Y = (400\angle 120^o)/(8.94\angle 63.4^o) = 44.74\angle -183.4^0$A.

9. In the question 7, determine the phase current I_B.
a) $44.74\angle 303.4^0$A
b) $44.74\angle -303.4^0$A
c) $45.74\angle 303.4^0$A
d) $45.74\angle -303.4^0$A
View Answer

Answer: b
Explanation: Taking the line voltage $V_{RY} = V\angle 0^0$ as a reference $V_{RY} = 400\angle 0^0$V, $V_{YB} = 400\angle -120^0$V and $V_{BR} = 400\angle -240^0$V. Impedance per phase = (4+j8) Ω = $8.94\angle 63.4^0$Ω. Phase current $I_B = (400\angle 240^o)/(8.94\angle 63.4^o) = 44.74\angle -303.4^0$A.

10. Determine the power (kW) drawn by the load.
a) 21

b) 22

c) 23

d) 24

View Answer

Answer: d

Explanation: Power is defined as the product of voltage and current. So the power drawn by the load is $P = 3V_{Ph}I_{Ph}\cos Ø = 24k$

UNIT-3

1. The current in the R-L circuit at a time t = 0+ is?
a) V/R
b) R/V
c) V
d) R
View Answer

Answer: a
Explanation: The capacitor never allows sudden changes in voltage, it will act as a short circuit at t = 0+. So the current in the circuit at t = 0+ is V/R.

2. The expression of current in R- C circuit is?
a) i=(V/R)exp(t/RC)
b) i=(V/R)exp(-t/RC)
c) i=(V/R)-exp(t/RC)
d) i=(V/R)-exp(-t/RC)
View Answer

Answer: b
Explanation: The particular solution of the current equation is zero. So the expression of current in R- C circuit is i=(V/R)exp(-t/RC).

3. In an R-C circuit, when the switch is closed, the response _____
a) do not vary with time
b) decays with time
c) rises with time
d) first increases and then decreases
View Answer

Answer: b
Explanation: In a R-C circuit, when the switch is closed, the response decays with time that is the response V/R decreases with increase in time.

4. The time constant of an R-C circuit is?
a) RC
b) R/C

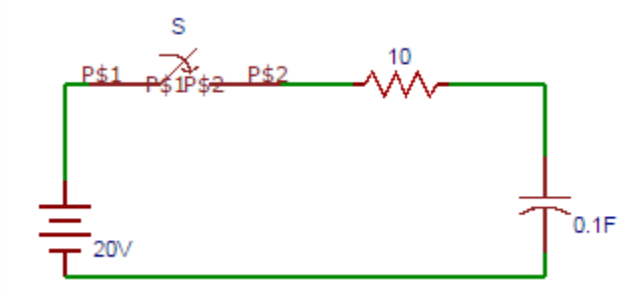
c) R
d) C
View Answer

Answer: a
Explanation: The time constant of an R-C circuit is RC and it is denoted by τ and the value of τ in dc response of R-C circuit is RC sec.

5. After how many time constants, the transient part reaches more than 99 percent of its final value?
a) 2
b) 3
c) 4
d) 5
View Answer

Answer: d
Explanation: After five time constants, the transient part of the response reaches more than 99 percent of its final value.

6.A series R-C circuit consists of resistor of 10 and capacitor of 0.1F as shown in the figure. A constant voltage of 20V is applied to the circuit at t = 0. What is the current in the circuit at t = 0?



a) 1
b) 2
c) 3
d) 4
View Answer

Answer: b
Explanation: At t = 0, switch S is closed. Since the capacitor does not allow sudden changes in voltage, the current in the circuit is i = V/R = 20/10 = 2A. At t = 0, i = 2A.

7. The expression of current obtained from the circuit in terms of differentiation from the circuit shown in the question 6?
a) di/dt+i=1
b) di/dt+i=2
c) di/dt+i=3

d) di/dt+i=0

View Answer

Answer: d

Explanation: By applying Kirchhoff's law, we get

$$10i + \left(\frac{1}{0.1}\right)\int idt = 20$$

Differentiating with respect to t, we get 10 di/dt+i/0.1=0 => di/dt+i=0.

8. The current equation in the circuit shown in the question 6 is?

a) $i=2(e^{-2t})A$

b) $i=2(e^{2t})A$

c) $i=2(-e^{-2t})A$

d) $i=2(-e^{2t})A$

View Answer

Answer: a

Explanation: At t = 0, switch S is closed. Since the capacitor does not allow sudden changes in voltage, the current in the circuit is i = V/R = 20/10 = 2A. At t = 0, i = 2A. The current equation is $i=2(e^{-2t})A$.

9. The expression of voltage across resistor in the circuit shown in the question 6 is?

a) $V_R = 20(e^{t})V$

b) $V_R = 20(-e^{-t})V$

c) $V_R = 20(-e^{t})V$

d) $V_R = 20(e^{-t})V$

View Answer

Answer: d

Explanation: The expression of voltage across resistor in the circuit is $V_R = iR = (2(e^{-t}))\times 10 = 20(e^{-t})V$.

10. Determine the voltage across the capacitor in the circuit shown in the question 6 is?

a) $V_C = 60(1-e^{-t})V$

b) $V_C = 60(1+e^{t})V$

c) $V_C = 60(1-e^{t})V$

d) $V_C = 60(1+e^{-t})V$

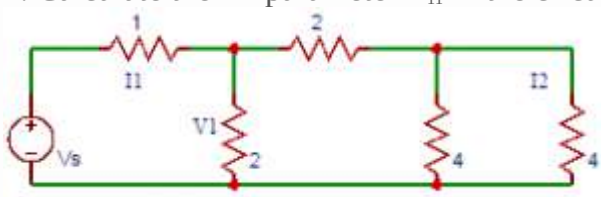
View Answer

Answer: a

Explanation: The expression of voltage across capacitor in the circuit $V_C = V(1-e^{-t/RC}) = 20(1-e^{-t})V$.

UNIT-4

1. Calculate the Z –parameter Z_{11} in the circuit shown below.



a) 1.5
b) 2.5
c) 3.5
d) 4.5
View Answer

Answer: b
Explanation: The Z –parameter Z_{11} is V_1/I_1, port 2 is open circuited. $V_1 = (1+1.5)I_1 \Rightarrow V_1/I_1 = 2.5$ and on substituting, we get $Z_{11} = 2.5\Omega$.

2. Determine the Z-parameter Z_{12} in the circuit shown in question 1.
a) 1
b) 2
c) 3
d) 4
View Answer

Answer: a
Explanation: The Z-parameter Z_{12} is $V_2/I_1 |I_2=0$. On open circuiting port 2 we obtain the equation, $V_1 = (1.5) I_2 \Rightarrow V_1/I_1 = 1.5$. On substituting we get $Z_{12} = 1.5\Omega$.

3. Determine the Z-parameter Z_{21} in the circuit shown in question 1.
a) 4
b) 3
c) 2
d) 1
View Answer

Answer: d
Explanation: The Z-parameter Z_{21} is $V_2/I_1 |I_2=0$. On open circuiting port 2, we get $V_2 = (1.5)I_1 \Rightarrow V_2/I_1 = 1.5$. On substituting we get $Z_{21} = 1.5\Omega$.

4. Determine the Z-parameter Z_{22} in the circuit shown in question 1.
a) 1
b) 3
c) 2

d) 4

View Answer

Answer: c

Explanation: The Z-parameter Z_{21} is V_2/I_2 $|I_1=0$. This parameter is obtained by open circuiting port 1. So we get $V_2 = ((2+2)||4)I_2 \Rightarrow V_2 = 2(I_2) \Rightarrow V_2/I_2 = 2$. On substituting $Z_{21}= 2\Omega$.

5. Find the value of V_1/I_1 in the circuit shown in question 1.

a) 1.25

b) 2.25

c) 3.25

d) 4.25

View Answer

Answer: b

Explanation: We have the relation $V_1/I_1=Z_{11}– Z_{12}Z_{21}/(Z_L+Z_{21})$ and Z_L is the load impedance and is equal to 2Ω. On solving $V_1/I_1=2.5-1/(2+2)=2.25\Omega$.

6. Determine the input impedance of the network shown in question 1.

a) 4.25

b) 3.25

c) 2.25

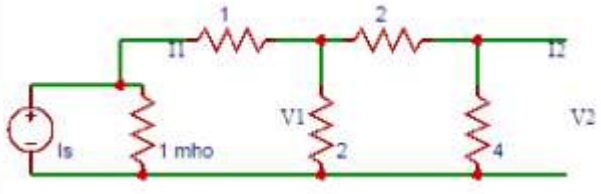
d) 1.25

View Answer

Answer: b

Explanation: From the figure by inspection we can say that the source resistance is 1Ω. So $Z_{in} = (V_1/I_1)$ + Source resistance. We had $V_1/I_1 = 2.25$. On substituting $Z_{in}=1+2.25=3.25\Omega$.

7. Determine the value of source admittance in the circuit shown below.



a) 1

b) 2

c) 3

d) 4

View Answer

Answer: a

Explanation: From the figure the value of the admittance parallel to the current source is 1 mho and this is the value of source admittance. So Y_s = 1 mho.

8. Find the value of I_2/V_2 in the circuit shown in question 7.

a) 7/6

b) 6/7

c) 7/12

d) 12/7

View Answer

Answer: c

Explanation: The relation between I_2/V_2 and Y-parameters is I_2/V_2=(5/8×1+5/8×1/2-1/16)/(1+1/2)=7/12 mho.

9. The value of the Y-parameter Y_{22} in the circuit shown in question 7.

a) 12/7

b) 6/7

c) 7/6

d) 7/12

View Answer

Answer: d

Explanation: The relation between Y_{22} and I_2/V_2 is $Y_{22}= I_2/V_2$. We have the relation $I_2/V_2 = (Y_{22}Y_s+Y_{22}Y_{11}-Y_{21}Y_{12})/(Y_s+Y_{11})$. On substituting their values in the equation we get Y_{22} = 7/12 mho.

10. The value of the Z-parameter Z_{22} in the circuit shown in question 7.

a) 6/7

b) 7/12

c) 12/7

d) 7/6

View Answer

Answer: c

Explanation: The Z-parameter Z_{22} is inverse of the Y-parameter Y_{22} i.e., $Z_{22} = 1/Y_{22}$. We got Y_{22} = 7/12. So on substituting we get Z_{22} = 12/7 mho

UNIT-5

1. Which filter type is called a flat-flat filter?

a) Cauer filter

b) Butterworth filter

c) Chebyshev filter

d) Band-reject filter
View Answer

Answer: b
Explanation: The key characteristic of the butterworth filter is that it has a flat pass band as well as stop band. So, it is sometimes called a flat-flat filter.

2. Which filter performs exactly the opposite to the band-pass filter?
a) Band-reject filter
b) Band-stop filter
c) Band-elimination filter
d) All of the mentioned
View Answer

Answer: d
Explanation: A band reject is also called as band-stop and band-elimination filter. It performs exactly the opposite to band-pass because it has two pass bands: $0 < f < f_L$ and $f > f_H$.

3. Given the lower and higher cut-off frequency of a band-pass filter are 2.5kHz and 10kHz. Determine its bandwidth.
a) 750 Hz
b) 7500 Hz
c) 75000 Hz
d) None of the mentioned
View Answer

Answer: b
Explanation: Bandwidth of a band-pass filter is Bandwidth= $f_H – f_L$=10kHz-2.5kHz=7.5kHz=7500Hz.

4. In which filter the output and input voltages are equal in amplitude for all frequencies?
a) All-pass filter
b) High pass filter
c) Low pass filter
d) All of the mentioned
View Answer

Answer: a
Explanation: In all-pass filter, the output and input voltages are equal in amplitude for all frequencies. This filter passes all frequencies equally well and with phase shift and between the two function of frequency.

5. The gain of the first order low pass filter
a) Increases at the rate 20dB/decade
b) Increases at the rate 40dB/decade

c) Decreases at the rate 20dB/decade

d) Decreases at the rate 40dB/decade

View Answer

Answer: c

Explanation: The rate at which the gain of the filter changes in the stop band is determined by the order of filter. So, for a low pass filter the gain decreases at the rate of 20dB/decade.

6. Which among the following has the best stop band response?

a) Butterworth filter

b) Chebyshev filter

c) Cauer filter

d) All of the mentioned

View Answer

Answer: c

Explanation: The cauer filter has a ripple pass band and a ripple stop band. So, generally cauer filter gives the best stop band response among the three.

7. Determine the order of filter used, when the gain increases at the rate of 60dB/decade on the stop band.

a) Second-order low pass filter

b) Third-order High pass filter

c) First-order low pass filter

d) None of the mentioned

View Answer

Answer: b

Explanation: The gain increases for high pass filter. So, for a third order high pass filter the gain increases at the rate of 60dB/decade in the stop band until $f=f_L$.

8. Name the filter that has two stop bands?

a) Band-pass filter

b) Low pass filter

c) High pass filter

d) Band-reject filter

View Answer

Answer: a

Explanation: A band-pass filter has two stop bands: 1) $0 < f < f_L$ and 2) $f > f_H$.

9. The frequency response of the filter in the stop band.

i. Decreases with increase in frequency

ii. Increase with increase in frequency

iii. Decreases with decrease in frequency

iv. Increases with decrease in frequency

a) i and iv

b) ii and iii

c) i and ii

d) ii and iv

View Answer

Answer: c

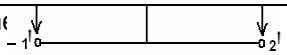
Explanation: The order of frequency of the filter in the stop band determines either steady decreases or increases or both with increase in frequency

QUESTION BANK:

1. Group - I (Short Answer Questions)

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I THREE PHASE CIRCUITS		
1	What are the advantages of a poly phase system over a single phase system	Understand	i
2	Derive the relationship between line and phase quantities in a 3-phaseStar Star connected system connected system balanced, i) Star connected system	Understand	i
3	Derive the relationship between line and phase quantities in a 3-phase Delta connected system for balanced delta system	Understand	i
4	Three identical impedances of (3+j4) ohm are connected in delta. Find an equivalent star network such that the line current is the same when connected to the the same supply	Evaluate	ii
5	Derive the expressions for wattmeter readings in two wattmeter method with balanced star connected load connected load	Understand	i
6	On a symmetrical 3-phase system, phase sequence RYB, a capacitive reactance of 8 is across YB and a coil (R+jX) cross RY. Find R and X such that Iy =0	Evaluate	ii
7	Derive the formula for power factor in two wattmeter method	Understand	i
8	Three identical resistances are connected in a star fashion against a balanced three phase voltage supply. If one of the resistances is removed, how much power is to be reduced?	Evaluate	ii

9	Explain the effect of power factor on wattmeter readings in two wattmeter method.	Remember	i
10	Explain how reactive power can be measured in three phase circuits	remember	i
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcome**
UNIT-II DC AND A.C TRANSIENT ANALYSIS			
1	Explain why the current in a pure inductance cannot change in zero time.	Remember	i

2	Explain why the voltage across a capacitor cannot change instantaneously.	Remember	i
3	What is the significance of time constant of R-L circuit? What are the different ways of defining time constant?	Remember	i
4	Derive the expression for i(t) of a R-L series circuit when DC voltage is applied to it at t=0 by closing the switch. Draw the response curve i(t) vs t. define time constant of R-L series circuit.	Analyze	ii
5	Derive the expression for i (t) and voltage across a capacitor Vc(t) for series R-C circuit with D.C voltage applied to it at t=0.Explain about the time constant of R-C circuit	Evaluate	ii
6	Compare the classical and Laplace transform methods of solution of the network	Understand	i
7	Derive an expression for the current response in R-L series circuit with a sinusoidal source	Remember	i
8	Distinguish between steady state and transient response	Remember	i
9	A Sinusoidal Voltage of 12 sin 8 t Volts is applied at t = 0 to a RC series of R= 4Ω and L = 1 H. By Laplace transform method determine the circuit current i (t) for. Assume zero initial condition	Evaluate	ii
10	What are initial conditions? Explain the procedure to evaluate initial conditions	Remember	i
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcome**
	UNIT-III NETWORK FUNCTIONS		
1	What is a pole-zero plots? What is its significance? Explain time domain behavior from pole zero plot.	Understand	i
2	Define and explain the following : port, driving point functions And Transfer functions.	Understand	i
3	What is a transfer function? Explain the necessary conditions for transfer Functions	Remember	i
4	What is a driving point function? Explain the necessary conditions for driving point functions	Remember	i
5	According to Routh Criteria when a network is said to be stable?	Apply	v
6	The Laplace transform of a voltage v(t) is V(s)=4(s+1)/(s+2)(s+3). Draw poles and zeros of this function and determine v(t) using pole-zero plot	Apply	v
7	The transform voltage V(s) of a network is given by V(s) =4s/(s+2)(s2+2s+2) plot its pole-zero diagram and hence obtain v(t)	Apply	v
8	Find the stability of the network Q(S) =40S/S3 +2S2+8S+1	Evaluate	ii
9	Find Y parameters for the  in Figure	Evaluate	ii
10	For the given network function draw pole zero diagram and hence obtain the time domain response i(t) if I(s) = 5S / (S+1)(s2+4S+8)	Apply	v

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-IV NETWORK PARAMETERS		
1	Define active and passive ports	Understand	i
2	Why Z-parameters are called as open circuit impedance (Z) parameter	Understand	i

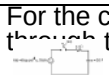
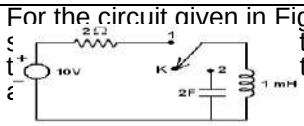
3	Define open circuit forward transfer impedance	Understand	i
4	Give the condition for reciprocity for Z parameters	Understand	i
5	Why Y parameters are called as short circuit admittance Parameters	Understand	i
6	What are the applications of cascaded ABCD parameters	Understand	i
7	Express y-parameters in terms of h-parameters	Understand	i
8	Express Z-parameters in terms of h-parameters	Understand	i
9	Express Z parameters in terms of ABCD parameters	Understand	i
10	Express h-parameters in terms of ABCD parameters	Understand	i
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcome**
UNIT-V FILTERS AND FOURIER ANALYSIS OF A.C CIRCUITS			
1	Define a filter and What are the classification of filters	Understand	i
2	Explain the formula for characteristic impedance of symmetrical T-Section	Understand	i
3	Explain the design procedure for a constant K low pass filter and its Characteristics	Understand	i
4	Find the component values of a constant K. LPF having characteristic impedance Z = 500Ω and cut off frequency of 'f_c'= 500 Hz. Find the frequency $_0$ at which this filter produces an alternation constant of 38.2 dB	Evaluate	v
5	Write short note on m-derived filters	Remember	i
6	Design a constant K band elimination filter with cut off frequency 1750 Hz to 4250 Hz and a characteristic impedance of 250Ω	Evaluate	i
7	Write short notes on Fourier transform theorems.	Understand	i
8	Write short notes on Exponential form of Fourier series	Understand	i
9	Write short notes on Line and phase angle spectra	Understand	i
10	Write short notes on Fourier integrals	Understand	i

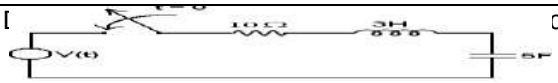
2. Group - II (Long Answer Questions)

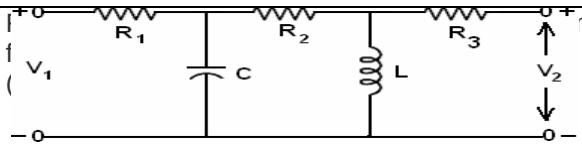
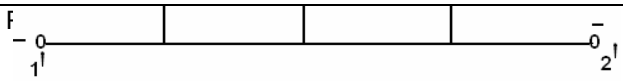
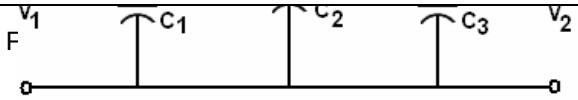
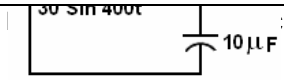
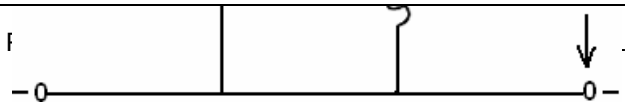
S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
UNIT-I THREE PHASE CIRCUITS			
1	A three phase balanced delta connected load of (10+j8) ohm is connected across a 400V, 3-Ø balanced supply. Determine the phase currents and line currents. Assume the phase of sequence to be RYB. Also calculate the power drawn by load.	Evaluate	ii
2	Three impedance each 5 +j12 ohm is connected in star are connected to a 220 V three phase, 50 HZ supply. Calculate the line currents and the power drawn by the circuit	Evaluate	ii
3	A three phase balanced delta connected load of (4+j8) ohm is connected across a400V, 3-Ø balanced supply. Determine the phase currents and line currents. Assume the phase of sequence to be RYB. Also calculate the power drawn by load.	Evaluate	ii
4	A balanced 3-phase star connected load of 200 kW takes a leading current of 150 amps with a line voltage of 1200 V at 50 Hz. What are the circuit constants of the load per phase?	Evaluate	ii

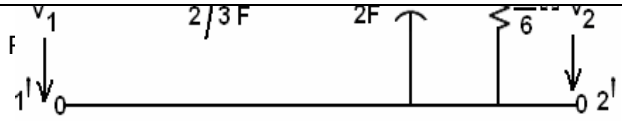
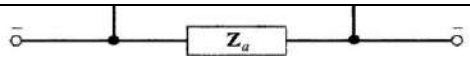
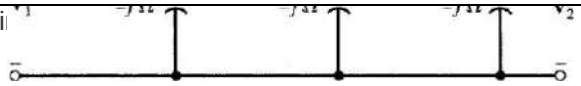
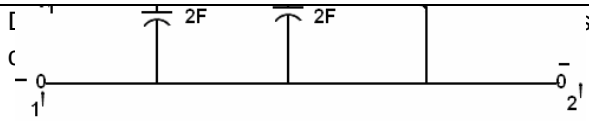
5	The two watt meter readings in a 3 - phase power measurement are 800 W and 400 W. The latter reading is being obtained after the reversal of current coil. Calculate the total power and power factor of the load	Evaluate	ii
6	A 3-phase 500 V motor operates at a power factor of 0.4 and takes an input power of 30 kW. Two watt meters are employed to measure the input power. Find readings on each instrument.	Evaluate	ii
	A balanced three phase is connected to balanced 3 - phase power system. The	Evaluate	ii

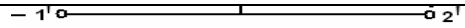
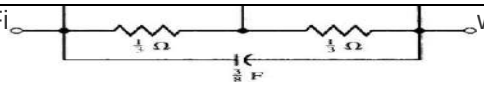
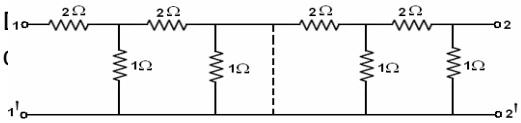
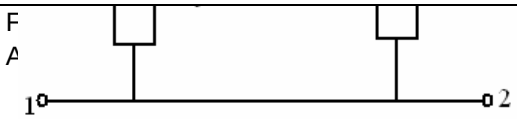
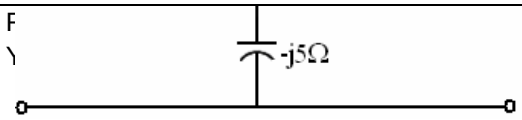
6	For the circuit shown in Figure determine the particular solution for i(t) through the circuit. Assume zero initial conditions	Evaluate	ii

7	line voltage is 480 volts and the line current is 10 A. the angle of the phase impedance of the load 60. Find the complex power and real power absorbed by the load.		
8	Two wattmeters are used to measure power in a 3-phase three wire load. Determine the total power, power factor and reactive power, if the two wattmeter's read i) 1000W each, both positive ii) 1000W each, but of opposite sign.	Evaluate	ii
9	Three star connected impedances 5030, 4060, 4060 ohms are connected to a 400V, 3-Phase supply. Determine the line currents and the two watt meter readings when power is measured by 2 watt meter method and abc is the phase sequence.	Evaluate	ii
10	A star connected load of Z = 6Ω, Z = j5Ω, Z = j7Ω is supplied by a 400V, 3-Ø symmetrical supply. Determine the line currents. The phase sequence is RYB. (R Y B)	Evaluate	ii
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcome**
	UNIT-II		
1	For the circuit shown in Figure determine the particular solution for i(t) through the circuit. Assume zero initial conditions 	Evaluate	ii
2	Derive an expression for the response in the system in Figure.2 By time domain and Laplace transform techniques. Cross Check the answer. V (t) = 5(Sin1000t+π/6).	Evaluate	ii
3	For the circuit given in Figure steady state conditions are reached for the s t t = 0, the switch is changed to position 2. Use t to determine the current through the inductor for a 	Evaluate	Ii
4	A series RL circuit with R = 50 ohms and L = 0.2 H has a sinusoidal voltage source V = 150 (500*Sint* φ+ volts applied at a time when φ=0. Find the expression for the total current. Use Laplace transforms method.	Evaluate	Ii
5	A series R C circuit with R = 100 Ω and C = 25 μF has a Sinusoidal excitation V (t) = 250 Sin 500t. Find the total current assuming that the capacitor is initially uncharged	Evaluate	Ii

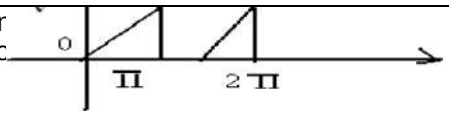
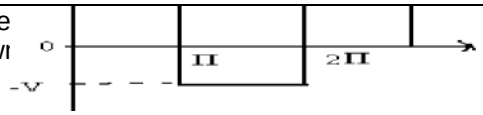
6	For the circuit shown in Figure determine the particular solution for i(t) through the circuit. Assume zero initial conditions	Evaluate	Ii
3	[ cuit	Evaluate	V

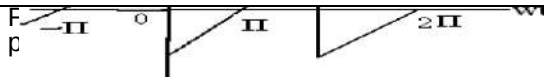
4	 nine the transfer	Analyze	V
5		Evaluate	V
6	 uit in Figure	Evaluate	V
7	 ircuit for given circuit and obtain i(t)	Evaluate	V
8	 .2[V2(S)/V1(S)]	Evaluate	V
9	For the circuit shown in the Figure.3, find i(t). Assume zero initial conditions. Use Laplace transforms approach. The switch is closed at t = 0.	Evaluate	V

10		Evaluate	V
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcome**
	UNIT-IV NETWORK PARAMETERS		
1	O  ork	Evaluate	Ii
2	Fi 	Evaluate	Ii
3	[ ; connected in	Evaluate	ii
4	Find the h-parameters for the circuit in figure	Evaluate	ii

			
5	Fi  wn	Evaluate	ii
6	 vorks connected in	Evaluate	ii
7	The Z parameters of a two port network are Z11=6Ω, Z22=4Ω, Z12=Z21= 3Ω Compute Y and ABCD Parameters and write the describing equations	Evaluate	ii
8	Discuss in detail about series and parallel connection of two port networks	Analyze	ii
9	F  n in Figure.3) determine A	Evaluate	ii
10	F  n in Figure.4) determine Y	Evaluate	ii

1	A r.m.s voltage in a three phase star circuit is given by 231V (ph. –N). Write the instantaneous voltage expression. If the current in each phase lag the corresponding phase voltages by 30° what are the expressions of instantaneous currents?	Evaluate	ii
2	A Three phase 4 wire 100 V (L-L) system supplied a balanced Y connected load having impedances of 10 - 30°Ω in each phase. Find line currents and draw the phasor diagram. How much current is flowing through the neutral	Evaluate	ii
3	A Δ connected load half a parallel combination of resistance (5 Ω) in each phase. If a balanced 3 phase 400 V supply is applied between lines, find the	Evaluate	ii

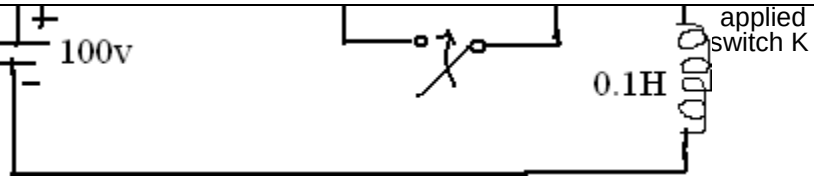
S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-V **FILTERS AND FOURIER ANALYSIS OF A.C CIRCUITS**		
1	Design a low pass filter (both T and π sections) having a cutoff frequency of 2 KHz to operate with a terminated load resistance of 500Ω	Analyze	v
2	Design a symmetrical T-attenuation to give 20 dB attenuation and to have characteristic impedance of 300Ω	Analyze	v
3	Design a symmetrical T attenuator to give 2 dB attenuation to have a characteristic impedance of 150Ω	Analyze	v
4	Draw the circuit diagram of a Band pass filter. Explain the design procedure of the above filter in detail	Analyze	v
5	Draw the circuit diagram of a High pass filter. Explain the design procedure of the above filter in detail	Analyze	v
6	Draw the circuit diagram of a Low pass filter. Explain the design procedure of the above filter in detail	Analyze	v
7	Design a proto type section of band pass filter having cut-off frequencies of 12KHz and,16 KHz and a design impedance of 600 ohm	Analyze	v
8	Fir  the wave shown in fig. and plc	Analyze	ii
9	Find the expone  waveform show	Analyze	ii

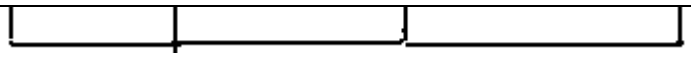
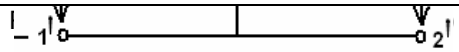
10	F  p /eform shown in fig and	Analyze	ii

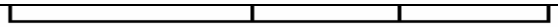
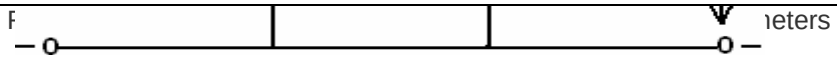
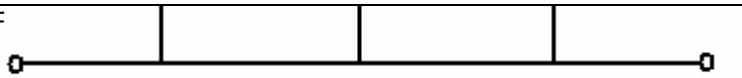
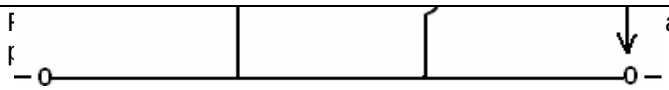
Group – III ANALYTICAL

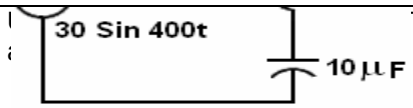
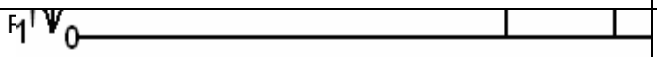
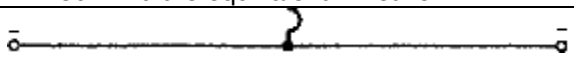
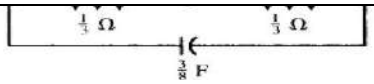
S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT-I **THREE PHASE CIRCUITS**		

3	Fir  Use Laplace method	Analyze	ii
4	Find I c (t) at t = 0 + while the switching is done from x to y at t = 0. As shown in figure.	Analyze	ii

	phase currents and line currents and draw the phasor diagram.		
4	A 3 phase, star connected system with 400 V (L-L) is disconnected to three loads: 25 0° , 11 - 20° ohm (also connected in star). Find the line current, power and the current in the neutral of the system.	Evaluate	ii
5	A three phase Y connected load has an inductor of 500 mH and capacitance of 100 µF in each phase. The load is connected across a 100V, 50Hz three phase balanced system Find the line currents for the load.	Evaluate	ii
6	The power in a three phase circuits is measured by two wattmeters. If the total power is d50kW, power factor being 0.8 leading, what will be the reading of each wattmeter? For what plf. Will one of the wattmeter's read zero?	Evaluate	ii
7	A three phase 400 V, 50Hz, 25 HP motorist delta connected and is operating at 0.85 lag and efficiency of 80% What is the line current?	Evaluate	ii
8	A three phase induction motor takes 100 kVA at 0.6 p.f. (lag) from a 440 V three phase 50 Hz source (balanced). There is another load on the same line and the load is connected in form of a Δ having 8 Ω resistance and – j 24 Ω reactance in series in each phase. Find the total VA power, average power, reactive power. Line current and the p.f. of the combination.	Evaluate	ii
9	A balanced Y connected 3 phase load has an impedance of Zph(=5-j 4) ohms in each phase. Find the line currents if a balanced 3 ph source of 100 V are applied across it. Draw the phasor diagram?	Evaluate	ii
	UNIT-II **TRASIENT ANALYSIS**		
1	W in is =  applied switch K	Analyze	ii
2	A dc voltage of 20V is applied in a RL circuit where R = 5 and L = 10H. Find i. The time constant ii. The maximum value of stored energy.	Analyze	ii

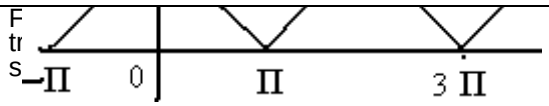
			
5	Define 1) Delay time 2) Peak over shoot 3) Settling time	Analyze	ii
6	A DC voltage of 20V is applied in a R-L circuit where R=5_ and L=10H. Find the i) Time constant ii) The maximum value of stored energy	Analyze	ii
7	A series R-L circuit with R=100_, L=1H has a sinusoidal voltage source 200sin (500t+¢) applied at time when¢=0. Find i) The expression for current ii) At what value of ¢ must the switch be closed so that the current directly enter steady state.	Analyze	ii
8	A series RC circuit, with R=50_, C=10μF has a sinusoidal voltage 230_2sin (2_x50t). Find the transient response	Analyze	ii
9	A series R-L circuit with R=50_ and L=0.2H, has a sinusoidal voltage source V=150sin (500t+¢)V applied at time when¢=0. Find the complete current	Analyze	ii
10	A series RLC circuit with R=5_, L=0.1H, C=500μF has a sinusoidal voltage v=100sin(250t+¢) volts applied at time when¢=0. Find the resulting current	Analyze	ii
	UNIT-III **NETWORK FUNCTIONS**		
1	 for the circuit in the figure	Evaluate	ii
2	 rameters	Evaluate	ii
3	For the circuit given below determine current supplied by the source, total active & reactive powers also draw the phasor diagram.	Evaluate	ii

			
4		Evaluate	ii
5		Evaluate	ii
6		Evaluate	ii
7		Evaluate	ii
8		Evaluate	ii
9	For the circuit shown in the Figure.3, find i(t). Assume zero initial conditions.		ii

	 The switch is closed	Evaluate	
10		Evaluate	v
	UNIT-IV **NETWORK PARAMETERS**		
1	In a T network Z1 = 2_ 0o, Z2 = 5 _− 90o, Z3 = 3_ 90o, find the Z-parameters	Analyze	ii
2	Z-parameters for a two port network are given as Z11=25, Z12=Z21=20, Z22=50. Find the equivalent T-network.	Analyze	ii
3	 Find the Z-parameters in the above circuit	Analyze	ii
4	Fi 	Analyze	ii
5	Two two-port networks a and b with transmission parameters Ta and Tb are connected in cascade. Obtain Z parameters of the	Analyze	ii

	combination.		
6	Find the Z-parameters of the two-port circuit of Fig.	Analyze	ii

			
7	Derive the formulas for image impedance of two port networks.	Analyze	i
8	Obtain Y parameters in terms of transmission parameters.	Analyze	i
9	What is the condition of reciprocity and symmetry for H parameters?	Analyze	i
10	What is the condition of reciprocity and symmetry for ABCD parameters?	Analyze	i
	UNIT-V **FILTERS AND FOURIER ANALYSIS OF A.C CIRCUITS**		
1	Design a low pass T and _ section filters having a design impedance R0=600_ and cut-off frequency =2000Hz	Analyze	v
2	Design a proto type section of band pass filter having cut-off frequencies of 1 KHz and, 5 KHz and a design impedance of 600Ω_?	Analyze	v
3	Design a proto type section of band pass filter having cut-off frequencies of 12KHz and,16 KHz and a design impedance of 600 ohm?	Analyze	v
4	A constant K low pass filter is designed to cut-off at a frequency of 1000Hz and the resistance of the load circuit is 50ohm. Calculate the values of the corresponding components required.	Analyze	v
5	Design a constant k-high pass filter to have a cut-off frequency of 2 KHz and a design impedance of 100ohm	Analyze	v
6	Design a constant k filter to eliminate band of frequencies lying between 2000Hz and 5000Hz with a design impedance of 600ohm	Analyze	v
7	Design a band pass filter with cut off frequencies of 2000Hz and 5000Hz and a design impedance of 500ohm	Analyze	v
8	Design a constant k high pass filter to cut off at 10KHz and design impedance of 600ohm	Analyze	v

9	F tr s  	Analyze	i i
10	What are the properties of Fourier series	Analyze	i i
11	Design a low pass T and _ section filters having a design impedance R0=600_ and cut-off frequency =2000Hz	Analyze	i i

HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE

(COLLEGE OF ENGINEERING)

Bogaram (V), Keesara (M), R.R. Dist – 501 301

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

HAND BOOK

PROGRAMME: B.Tech EEE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **ELECTRONIC CIRCUITS**	SEMESTER: I CREDITS: 4 COURSE COORDINATOR: D Jayakumar
COURSE CODE: **EE305ES** REGULATION:**R16**	COURSE TYPE: CORE
COURSE AREA/DOMAIN: ECE	CONTACT HOURS: 4+1 (Tutorial) hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY):	LAB COURSE NAME: NILL

COURSE OVERVIEW:

This course focus on integrated circuit design concepts and assumes that you are familiar with discrete circuit design. System, signal, circuit and component considerations are incorporated. The course is designed to give you

broad and applicable skills in designing integrated circuits for a wide range of applications such as chip design, medical implantable devices, integrated sensory systems, many applications that have extreme power consumption limitations and require long-term battery life (e.g. wireless sensors).

PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
1	Basic electric and Electronic circuits	Concepts of Active and passive components, working of transistor , diodes ect	I-I

MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
Mid Semester Test • There shall be two midterm examinations. • Each midterm examination consists of subjective type and objective type tests. • The subjective test is for 10 marks of 60 minutes duration. • Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. • The objective type test is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. • First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. **Assignment** • Five marks are earmarked for assignments. • There shall be two assignments in every theory course. Marks shall	75	100

be awarded considering the average of two assignments in each course.		

EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	80minutes	20
2	I Assignment	-	5
3	II Mid Examination	80minutes	20
4	II Assignment	-	5
5	External Examination	3 hours	75

COURSE OBJECTIVES & COURSE OUTCOMES

SNO	**COURSE OBJECTIVES**	**COURSE OUTCOMES**	PO MAPPING
1	Electrical circuits plays significant role in day to day life of entire mankind.	Ability to understand the basic idea about signals and systems	BL 1,2
2	This course deals with the concept of different types of amplifiers, oscillators,	Understanding the objective of using various	BL 1,4

	vibrators, clippers, clampers, switching characteristics of various semiconductor devices, linear wave shaping and frequency response of bipolar junction transistor and field effect transistor.	transformation to solve any analysis in Communication signals.	

Blooms level(BL)

BL: 1 Remember / Knowledge

BL 2 Understanding

BL 3Apply

BL 4 Analyze

BL 5 Evaluate

BL 6 Crate

HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by	Blooms Level
A	An ability to apply knowledge of mathematics, science and engineering	S	Solving Gate and Text book Problems	APPLY
B	An ability to design and conduct experiments, as well as to analyze and interpret data	S	Solving Gate and Text book Problems	APPLY
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	H	Assignment and Gate questions	Apply and Analyze

D	An ability to identify, formulate and solve engineering problems.	S	Class Test & Group Activity	Apply
E	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	S	Mini and Micro Projects	Apply
F	An ability to understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.	N	--	--
G	An ability to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.	H	Mini / Micro Projects and GATE questions	Analyze and Justify
H	An understanding of professional and ethical responsibility.	N	--	--
I	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	S	Class Test & Seminar	Analyze
J	An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.	S	Seminars	Understand & Analyze
K	An ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.	S	Mini and Micro Projects	Apply

L	Recognition of the need for, and an ability to engage in life-long analyzing.	S	Group Activity	Analyze
M	An ability to design and implement projects in the areas including Signal Processing, Microwaves, Communication Systems, IC Technology and Embedded Systems.	H	Mini and Micro Projects	Apply
N	An ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	S	Seminars & Projects	Analyze & Apply

N = None S = Supportive H = Highly Related

Syllabus:

UNIT - I

Single Stage Amplifiers: Analysis of CE,CB,&CC Amplifiers Classification of Amplifiers Distortion in Amplifiers, Comparison of CE, CB, CC Amplifiers Low frequency Analysis, Low frequency response of BJT Amplifiers ,Low frequency response of FET Amplifiers Miller Effect Capacitance, High Frequency response of BJT amplifiers, Square Wave Testing.

UNIT - II

Feedback Amplifiers: Concept of feedback Amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Voltage series, voltage shunt ,Current series and current shunt Feedback configurations, Illustrative problems
Oscillators: Conditions for oscillations, Frequency and Amplitude Stability of Oscillators, Generalized analysis of LC Oscillators, Quartz, Hartley, and Colpitt's Oscillators, RC –phase shift and Wein Bridge oscillators.

UNIT - III

Large Signal Amplifiers: Class A Power Amplifier, Maximum Efficiency of Class –A Amplifier, Transformer Coupled Amplifier, Push Pull Amplifier complimentary Symmetry Class-B Power Amplifier, Phase Inverters, Transistor Power Dissipation, Thermal Runway, Heat Sinks

UNIT - IV

Wave Shaping: High Pass, Low Pass RC Circuits, their response for Sinusoidal, Step, Pulse and Ramp Inputs. **Clippers and Clampers:** Diode Clippers, Transistor Clippers, Clipping at Two Independent Levels, Transfer Characteristics of Clippers, Comparators, Clamping Operation, Clamping Circuits using Diode with different inputs, Clamping Circuit Theorem, Practical Clamping Circuits.

UNIT - V

Switching Characteristics of Devices: Diode as a Switch, Piecewise Linear Diode Characteristics, Transistor as a Switch, Breakdown Voltage Consideration of Transistor, Design of Transistor Switch, Transistor Switching Times. **Multivibrators:** Analysis and Design of Bistable, Monostable, Astable, Multivibrators and Schmitt Trigger using Transistors.

TEXT BOOKS:

1. "Robert L Boylestead and Louis Nashelsky", "Electronic Devices and circuit theory", Pearson, Tenth edition 2009
2. "S. Salivahanan, N. Suresh Kumar and A. Vallava Raj", "Electronic Devices and circuits", TMH, 2nd Edition 2008.
3. "David A. Bell", "Solid state Pulse Circuits", PHI ,4th Edition 2007.

REFERENCE BOOKS:

1. "Robert T. Paynter", "Introductory Electronic Devices and Circuits", PEI,7 Edition, 2009.
2. "Anil. K. Maini, Varsha Agarwal", "Electronic Devices and Circuits", Wiley, 1st Edition 2009.
3. "Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao", "Pulse Digital & Switching Waveforms", TMH, 2nd Edition 2008.

COURSE PLAN:

S. No	Unit No	Topic	No of sessions planned	Mode of teaching BB/PPT /OHP/MM	Reference *	Remarks
1	I	Introduction	1	BB	A1,B1	
2		**Single Stage Amplifiers**	1	BB	A1,B1	
3		Analysis of CB,	2	BB	A1,B1	
4		Analysis of CC	1	BB	A1,B1	
5		Amplifiers Classification of Amplifiers Distortion in Amplifiers,	1	BB	A1,B1	
6		Comparison of CE, CB, CC Amplifiers	1	BB	A1,B1	
7		Amplifiers Distortion in Amplifiers	1	BB	A1,B1	
8		Low frequency Analysis,	1	BB	A1,B1	
9		Low frequency response of BJT Amplifiers ,	1	**PPT**	A1,B1	

10		Low frequency response of FET Amplifiers Miller Effect Capacitance,	1	BB	A1,B1	
11		High Frequency response of BJT amplifiers,	1	BB	A1,B1	
12		Square Wave Testing.	1	BB	A1,B1	
13		**Single Stage Amplifiers:** Analysis of CE,	1	**PPT**	A1,B1	
14		Example problems	1	**PPT**	A1,B1	
15	II	**Feedback Amplifiers**	1	**PPT**	A1,B1	
16		Concept of feedback Amplifiers,	1	**PPT**	A1,B1	
17		General characteristics of negative feedback amplifiers,	1	BB	A1,B1	
18		Effect of Feedback on Amplifier characteristics,	1	BB	A1,C1	
19		Voltage series, voltage shunt ,	1	BB	A1,C1	
20		Current series and current shunt Feedback configurations,	1	BB	A1,C1	
21		Illustrative problems **Oscillators:** Conditions for oscillations,	2	**PPT**	A1,C1	
22		Frequency an Amplitude Stability of Oscillators,	2	**PPT**	A1,C1	
23		Generalized analysis of LC Oscillators,	2	**PPT**	A1,C1	
24		Quartz, Hartley,	1	BB	A1,C1	
25		Colpitt's Oscillators, RC – phase shift and Wein Bridge	1	BB	A1,C1	

		oscillators				
26	III	**Large Signal Amplifiers introduction**	2	BB	A1,C1	
27		Class A Power Amplifier,	2	BB	A1,C1	
28		Maximum Efficiency of Class – A Amplifier,	2	BB	A1,C1	
29		Transformer Coupled Amplifier,	1	BB	A1,C1	
30		Push Pull Amplifier	1	BB	A1	
31		Example progrblems	1	BB	A1	
32		complimentary Symmetry Class-B Power Amplifier,	2	BB	A1	
33		Phase Inverters,	2	BB	A1	
34		Transistor Power Dissipation,	2	BB	A1	
35		Thermal Runway,	1	BB	A1	
36		Heat Sinks	1	BB	A1	
37	IV	**Wave Shaping introduction**	1	BB	A1	
38		High Pass,	1	BB	A1	
39		Low Pass RC Circuits,	2	BB	A1	
40		their response for Sinusoidal,	2	BB	A1	
41		Step, Pulse and Ramp Inputs. **Clippers and Clampers:**	1	BB	A1	
42		Diode Clippers, Transistor Clippers,	1	BB	A1	
43		Clipping at Two Independent Levels,	1			

44		Transfer Characteristics of Clippers,	1	BB	A1	
45		Comparators, Clamping Operation,	2	BB	A1	
46		Clamping Circuits using Diode with different inputs,	1	BB	A1	
47		Clamping Circuit Theorem,	1	BB		
48		Practical Clamping Circuits.	1	BB		
49	V	**Switching Characteristics of Devices:**	1	BB	A1	
50		Diode as a Switch,	1	BB	A1	
51		Piecewise Linear Diode Characteristics,	1	BB	A1	
52		Transistor as a Switch,	1	BB	A1	
53		Breakdown Voltage Consideration of Transistor,	1	BB	A1	
54		Design of Transistor Switch,	1	BB	A1	
55		Transistor Switching Times.	1	BB	A1	
56		Analysis and Design of Bistable	1	BB	A1	
57		Monostable, Astable, Multivibrators	1	BB	A1	
58		Schmitt Trigger using Transistors	1	BB	A1	

Text Books

A1. “Robert L Boylestead and Louis Nashelsky”, “Electronic Devices and circuit theory”, Pearson, Tenth edition 2009

B1. "S. Salivahanan, N. Suresh Kumar and A. Vallava Raj", "Electronic Devices and circuits", TMH, 2nd Edition 2008.
C1. "David A. Bell", "Solid state Pulse Circuits", PHI ,4th Edition 2007.

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objective	Course Outcomes				
	a	**b**	**c**	**d**	**e**
I		S			
II	S	S			
III				H	
IV				H	S
V					S

S= Supportive H= Highly Related

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
a	S													
b	S	S									S		S	S
c									H					
d		S				S					S		H	S
e	S		S		S		S				S		S	

S= Supportive H= Highly Related

S.NO	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
UNIT -I SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS			
1	Define an Amplifier?	Remembering	1
2	Describe the single stage amplifier?	Remembering	1
3	Write the advantages of CE configuration over CB and CC configurations?	Applying	1

4	Classify the amplifiers based on different parameters?	Understanding	1
5	Distinguish among three configurations?	Understanding	1
6	Write the advantages of FET over BJT?	Applying	2
7	Arrange the hybrid equivalent model of a CE amplifier?	Remembering	1
8	Discuss a small signal JFET model of a common drain amplifier.	Understanding	2
9	Define various hybrid parameters of a Transistor?	Remembering	1

10	List out the characteristics of Common Emitter amplifier?	Remembering	7
11	Explain the small signal model for common source amplifier?	Understanding	7
12	Write the advantages of Emitter follower?	Applying	7
13	List the benefits of H- Parameters?	Remembering	1
14	Name the typical values of h-parameters for a transistor in CE, CB, CC configurations?	Remembering	1
15	Explain the typical frequency response of an RC coupled amplifier	Understanding	1
16	Justify why the common emitter amplifier provides 180° phase shift between input and output?	Evaluating	1
17	Construct the approximate h-parameter model for CE amplifier?	Creating	1
19	Define a distortion in amplifiers? Give the classification of distortion?	Remembering	1
20	Define amplitude distortion?	Remembering	1
21	Define frequency distortion?	Remembering	1
22	Define phase or Delay distortion?	Remembering	1
23	Justify the statement, Why the amplitude distortion is called as harmonic distortion?	Evaluating	1
24	Analyze the components affecting the frequency response of RC coupled amplifier at low frequencies?	Analyzing	1
25	Justify the answer, why frequency response of RC coupled amplifier decreases at high frequencies?	Evaluating	1
26	Define the concept of feedback in amplifiers?	Remembering	4
27	Discuss the types of feedback?	Understanding	4
28	Classify the feedback amplifiers based on the type of mixing and type of sampling?	Understanding	4
29	Write the advantages of negative feedback?	Applying	4
30	Distinguish the negative feedback and positive feedback?	Analyzing	4
31	Discuss how does negative feedback reduce distortion in an amplifier?	Understanding	4
32	Define sensitivity of an amplifier?	Remembering	1
33	Analyze the effect of negative feedback on bandwidth?	Analyzing	4

34	Calculate new gain, if An amplifier with stage gain 200 is provided with negative feedback of feedback ratio 0.05.	Analyzing	4
35	Write the relation between lower cut off frequencies with and without feedback.	Applying	4
37	Calculate the feedback ratio, if An amplifier has a gain of 300. When negative feedback is applied, the gain is reduced to 240.	Analyzing	4
38	Estimate the input impedance of the feedback amplifier? If An amplifier with Zi = 2KΩ has a voltage gain A = 200. If a negative feedback of β = 0.01 is applied to it.	Evaluating	4
39	Calculate the feedback factor. Express the amount of negative feedback in dB. If the gain of an amplifier is decreased to 10,000 with negative feedback from its gain of 60,000.	Analyzing	4
40	Define an oscillator?	Remembering	4

	UNIT-II BJT AND FREQUENCY RESPONSE		
1	**Explain** the significance of logarithmic scale?	Understanding	3
2	**Define** "bel" and "Decibel"?.	Remembering	3
3	**Discuss** the half bandwidth calculation of a transistor?	Understanding	3
4	**Define** dBs?	Remembering	3
5	**Define** half power frequencies?	Remembering	3
6	**Discuss** the effect of emitter bypass capacitor on low frequency response of BJT amplifiers.	Understanding	3
7	**Sketch** the high frequency π model of a transistor and explain in brief.	Applying	3
8	**Define** fα and fβ cut-off frequencies in Hybrid-π model.	Remembering	3
9	**Define** square wave testing? What is need for it?	Remembering	3
10	**Define** fT?	Remembering	3
11	**Discuss** the effect of coupling capacitors on low frequency response of BJT amplifiers.	Understanding	3
12	**Write** short notes on miller"s theorem.	Creating	3
13	**Evaluate** the relationship between low frequency h-parameters and high frequency parameters.	Evaluating	3
14	**Describe** how internal capacitances affect the gain of BJT amplifier.	Evaluating	3
15	**Define** Band width of an amplifier?	Remembering	3

16	**Define** gain-bandwidth product?	Remembering	3
17	**Define** unity-gain frequency?	Remembering	
18	**Define** voltage gain of the amplifier at fT?	Remembering	3
19	**Discuss** the internal BJT capacitances and explain their effects.	Understanding	3
20	**Express** power gain in dB	Understanding	3
21	**Express** voltage gain in dB.	Understanding	3
22	**Evaluate** the mid-range voltage gain of a transistor?	Evaluating	3
23	**Sketch** a small signal JFET model of a common drain amplifier.	Applying	3
24	**Sketch** a voltage divider bias FET network.	Applying	3
25	**Write** the relationship between the hie and rbb".	Creating	3
	UNIT-III MULTIVIBRATORS, CLIPPERS AND CLAMPERS		
1	**Define** a multivibrator? How many states does it have.	Remembering	2
2	**Describe** a bistable multivibrator?	Understanding	2
3	**Classify** the multivibrators?.	Understanding	2
4	**Indicate** the other names of a bistable multivibrator?	Understanding	2
5	**Describe** the bistable multivibrator.	Understanding	2
6	**Define** an ac coupling in multivibrators?	Remembering	2
7	**Name** the applications of a bistable multivibrator?	Remembering	2
8	**Define** stable state of a binary?	Remembering	2
9	**Define** quasi-stable state?	Remembering	2

10	**Define** loading of a binary? What are its effects on the performance of a binary?	Remembering	2
11	**Discuss** the purpose of collector catching diodes in multivibrators?	Understanding	2
12	**Write** the advantage of a self biased binary over fixed biased binary?	Applying	2
13	**Define** commutating capacitors? Why are they required?	Remembering	2
14	**Indicate** the other names of commutating capacitors?	Understanding	2
15	**Define** triggering?	Remembering	2
16	**Name** the methods of triggering in multivibrators? Distinguish between them.	Remembering	2
17	**Define** unsymmetrical triggering? Where is it used?	Remembering	2
18	**Define** symmetrical triggering? Where is it used?	Remembering	2
19	**Write** the advantages and disadvantages of a direct coupled binary?	Applying	2

20	**Discuss** about a Schmitt trigger?	Understanding	2
21	**List** the applications of a Schmitt trigger?	Remembering	2
22	**Explain** how a Schmitt trigger converts a sine wave into a square wave.	Understanding	2
23	**Define** the terms i)Upper triggering point(UTP) ii) Lower triggering point(LTP)	Remembering	2
24	**Describe** a monostable multivibrator?	Understanding	2
25	**Indicate** the other names of a monostable multivibrator?	Understanding	2
S.NO	**QUESTION**	**BLOOMS TAXONOMY LEVEL**	**COURSE OUTCOMES**
26	**Explain** why is monostable multivibrator also called a delay circuit?	Understanding	2
27	**List** the applications of a monostable multivibrator?	Remembering	2
28	**Indicate** the type of triggering is used in a monostable multivibrator?	Understanding	2
29	**Describe** an astble multivibrator.	Understanding	2
30	**Write** the expression for the period of oscillation of an astable multivibrator when it used as square wave generator.	Applying	2
31	**Define** clipping in Non-linear wave shaping?	Remembering	2
32	**Name** the different types of clipping circuits?	Remembering	2
33	**Indicate** the other names of clipping circuits?	Understanding	2
34	**Name** the three configurations of clipping circuits?	Remembering	2
35	**Indicate** the devices required for clipping purposes? Name the commonly used ones.	Understanding	2
36	**Define** single ended clipping?	Remembering	6
37	**Describe** about the double ended clipping?	Understanding	6
38	**List** the applications of circuits?	Remembering	6
39	**Define** a comparator?	Remembering	6
40	**Distinguish** between comparator and clipping circuits.	Analyzing	6
41	**List** the applications of voltage comparators?	Remembering	6
42	**Define** clamping? What for clamping circuits are used?	Remembering	6
43	**Indicate** the other names of a clamping circuit?	Understanding	6
44	**Define** positive clamp?	Remembering	6
45	**Define** Negative clamp?	Remembering	6

46	**Justify** why the clamping circuit is also called a dc inserter?	Evaluating	6
47	**State** clamping circuit theorem.	Remembering	6
48	**Define** biased clamping?	Remembering	6
49	**Discuss** about practical clamping circuit?	Understanding	6
50	**Distinguish** between clipping and clamping?	Analyzing	6
	UNIT-IV **LARGE SIGNAL AMPLIFIERS, LINEAR WAVE SHAPING**		
1	**Define** a linear network?	Remembering	6
2	**Define** linear wave shaping?	Remembering	6
3	**Discuss** about a low pass circuit?	Understanding	6
4	**Define** cut-off frequency?	Remembering	6
5	**Evaluate** the relation between rise time and bandwidth of a low-pass circuit?	Evaluating	6
6	**Define** high-pass circuit?	Remembering	6
7	**Write** the condition for a high-pass circuit, which act as a differentiator?	Applying	6
8	**Define** peaking?	Remembering	6
9	**Justify** why RC circuits commonly used compared to RL circuits?	Evaluating	6
10	**Explain** why f1 is also called the 3-dB cut-off frequency of an RC high pass filter?	Understanding	6
11	**Define** the step waveform mathematically. Sketch the step waveform neatly.	Remembering	6
12	**Write** the expression for rise time t_r in terms of the time constant RC.	Applying	6
13	**Write** the expression for rise time t_r in terms of the cut-off frequency f2.	Applying	6
14	**Write** the condition for an RC low-pass filter to function as a good integrator?	Applying	6

S.NO	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
15	**Express** how does a capacitor behave for sudden changes in voltage?	Understanding	6
16	**Define** the terms collector dissipation and conversion efficiency of class A power amplifier	Remembering	6
17	**Define** a large signal amplifier?	Remembering	5
18	Distinguish between voltage amplifier and power amplifier?	Analyzing	5
19	**Write** the classification of power amplifiers?	Applying	5
20	**Calculate** the power that can be dissipated by a transistor at an ambient temperate of TA=500C, given Tj=2300C and θJA=1000C/W.	Analyzing	5

21	**Calculate** the junction temperature. If the thermal resistance of a transistor is 100C/W. It is operated at TA=250C and dissipates 3W of power. Calculated the junction temperature.	Analyzing	5
22	**Compare** the various classes of operation of power amplifiers based on operating cycle.	Evaluating	5
23	**Discuss** the basic reason for crossover distortion in class-B power amplifiers?	Understanding	5
24	**State** the advantages of push pull class B power amplifier over class B power amplifier	Remembering	5

25	**Define** harmonic distortion? How the output signal gets distorted due to the harmonic distortion?	Remembering	5
26	**Compare** push pull and complementary symmetry class-B power amplifiers.	Evaluating	5
27	**Define** Heat Sink. What is its function?	Remembering	5
28	**Define** conversion efficiency of power amplifier.	Remembering	5
29	**Define** thermal runaway?	Remembering	5
30	**Define** conversion efficiency of power amplifier.	Remembering	5
	UNIT-V **SWITCHING CHARACTERISTICS OF DEVICES**		
1	Justify how does a diode act as a switch?	Evaluating	6
2	Define dynamic and static resistance of a diode?	Remembering	6
3	Define storage time of a diode?	Remembering	6
4	Define transition time of a diode.	Remembering	6
5	Define reverse recovery time of a diode.	Remembering	6
6	Describe when does a transistor act as a) a closed switch b) an open switch	Understanding	6
7	Define a) Rise time b) storage time c) fall time	Remembering	6
8	Define turn ON time of a transistor?	Remembering	6
9	Translate the term BVCBO?	Understanding	6
10	Define BVCEO?	Remembering	6
11	Define the common emitter saturation resistance RCE (sat).	Remembering	6
12	Discuss the three regions of operation of a transistor?	Understanding	6

13	Define the limitations posed by the transistor breakdown voltages?	Remembering	6
14	Explain how does the temperature affect the saturation junction of a transistor?	Understanding	6
15	Define avalanche breakdown.	Remembering	6
16	Define turn-on time of a transistor.	Remembering	6
17	Define delay time of a transistor.	Remembering	6
18	Define zener breakdown.	Remembering	6
19	Define operating point?	Remembering	6
20	Define the turn ON time of a transistor.	Remembering	6

GROUP - II (LONG ANSWER QUESTIONS)

S.NO	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
	UNIT-I SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS		
1	**Evaluate** the equations for voltage gain , current gain, input impedance and output impedance for a BJT using low frequency h-parameter model for CE configuration.	Evaluating	1
2	**Evaluate** the equations for voltage gain, current gain, input impedance and output impedance for a BJT using low frequency h-parameter model for CB configuration.	Evaluating	1
3	**Evaluate** the equations for voltage gain , current gain, input impedance and output impedance for a BJT using low frequency h-parameter model for CC configuration.	Evaluating	1
4	**Evaluate** the expression for Ri, Ai, Av and Ro for CE amplifier with un bypassed Re.	Evaluating	1
5	**Classify** the amplifier circuits based on frequency range, type of coupling, power delivered and signal handled.	Understanding	1
6	**State** millers theorems. Explain its significance in transistor circuit analysis	Remembering	1
7	**Analyze** general transistor amplifier circuit using h-parameter model. Derive the expression for Ai,Av,Ri, Ro, Ais, Avs	Analyzing	1
8	**Define** h-parameters? Why they called so? Define them and what are the benefits of h-parameters	Remembering	1

9	**Explain** voltage shunt feedback amplifiers &current series feedback amplifiers?	Understanding	1
10	**Sketch** the block diagram of a feedback amplifier and derive the expressions for gain (1) with positive feedback and (2) with negative feedback. State the advantages of negative feedback.	Applying	1
11	**Estimate** the values of open loop Gain A and feedback ratio. For the given data iii) An amplifier, with feedback, has voltage gain of 100. When the gain without feedback changes by 20%and the gain with feedback should not vary more than 2%.	Understanding	1
12	**(**i) **Discuss** the circuits of voltage shunt and current series feedback amplifier and derive the expressions for input impedance Rif.	Understanding	**1**
13	**Explain** the relevant information, how the negative feedback improves stability reduce noise and Increase input impedance?	Understanding	1
14	**Design** the circuit diagram of CS amplifier. With the help of small signal model, derive the expressions for input impedance, output impedance and voltage gain.	Creating	1
15	(a) **Write** short notes on miller"s theorem. (b) **Analyze** a single stage transistor amplifier using h –parameters	Applying	1
16	**Sketch** the circuit diagram of CE amplifier with emitter resistance. Draw its approximate h-parameter model and derive the expression for AI, RI and AV.	Applying	1
17	**Show** that for voltage shunt feedback amplifier trans resistance gain, Ri and Ro are decreased by a factor (1+Aβ) with feedback.	Applying	1

S. No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
18	**Define** the following terms in connection with feedback i. Return difference, fb ii. Closed loop gain iii. Open loop gain	Remembering	1
19	**Sketch** the circuit diagram of CE amplifier with emitter resistance. Draw its approximate h-parameter model and derive the expression for AI, RI and AV.	Applying	1
20	**Explain** how h –parameters can be obtained from the static characteristics of a transistor.	Understanding	1
	UNIT-II **BJT AND FREQUENCY RESPONSE**		

1	**Evaluate** the expressions for fβ and fT.	Evaluating	3
2	**Discuss** the effect of coupling capacitor (Cc) on low frequency response of CE amplifier.	Understanding	3
3	**Sketch** the low frequency small signal model of a transistor in CB and CE configurations and explain significance of each model.	Applying	3

4	**Sketch** the small-signal high-frequency circuit of a CS amplifier and derive the expression for the voltage gain.	Applying	3
5	**Show** that (i) hfe=gm rb"e for a Hybrid _ model of CE amplifier.	Applying	3
6	**Explain** how does a Ce and Cc vary with | Ic | and | VCE |.	Understanding	3
7	**Explain** how does gm vary with | Ic | and | VCE |, T.	Understanding	3
8	**Evaluate** the expression for current gain with resistive load.	Evaluating	3
9	**Justify** why the gain of the amplifier decreases in the low frequency and high frequency range?	Evaluating	3
10	**Evaluate** the expression for the CE short-circuits current gain Ai as a function of frequency.	Evaluating	3
	UNIT-III MULTIVIBRATORS, CLIPPERS AND CLAMPERS		
1	**Explain** the working of a fixed-biased binary with neat diagram.	Understanding	6
2	**Explain** the working of a non-saturated binary. What are its drawbacks?	Understanding	6
3	**Discuss** the different methods of triggering a binary with neat sketches.	Understanding	6
4	**Explain** the working of a Schmitt trigger with neat sketches.	Understanding	6
5	**Evaluate** the expressions for UTP and LTP of a Schmitt trigger.	Evaluating	6
6	**Explain** how hysteresis can be eliminated in a Schmitt trigger.	Understanding	6
7	**Explain** the working of a collector-coupled monostable multivibrator, With the help of a neat circuit diagram and waveforms,.	Understanding	6
8	**Evaluate** an expression for the gate width of a monostable multivibrator.	Evaluating	6
9	**Explain** the working of an astable mulpivibrator. With help of a neat circuit diagram and waveforms.	Understanding	6
10	**Evaluate** an expression for the frequency of oscillation of astable multivibrator.	Evaluating	6
11	**Show** that an astable multivibrator can be used as a voltage to frequency convertor.	Applying	6
12	**Construct** the circuit of the astable multivibrator and explain how it works.	Creating	6

S. No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
13	**Explain** the working of a transistor clipper. With the help of a neat circuit diagram and waveforms.	Understanding	6
14	**Explain** the working of a two level diode clipping. With the help of a neat circuit diagram.	Understanding	6
15	**Explain** how a sine wave may be converted into square wave using a clipping circuit.	Understanding	6

16	**Explain** the working of a simple diode comparator. Draw the output wave form for a ramp input.	Understanding	6
17	**Explain** the working of a positive clamping circuit. With necessary waveforms.	Understanding	6

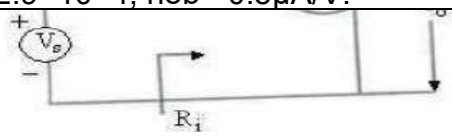
18	**Explain** the working of a Negative clamping circuit. With necessary waveforms.	Understanding	6
19	**State** and prove the clamping circuit theorem?	Remembering	6
20	**Explain** the principle of clamping. What is the need for a shunting resistor R in parallel with the diode in the basic clamping circuit?	Understanding	6
	UNIT-IV LARGE SIGNAL AMPLIFIERS, LINEAR WAVE SHAPING		
1	**Evaluate** the expression for maximum conversion efficiency for a simple series fed Class A power amplifier. What are the drawbacks of transformer coupled power amplifiers?	Evaluating	5
2	**Explain** the method of determination of total harmonic distortion in push pull power amplifiers using five point method.	Understanding	5
3	**Define** thermal resistance? Explain the thermal electrical analogy related to a transistor with heat sink.	Remembering	5
4	**Explain** and analyze a transformer coupled class A power amplifier and also define the total harmonic distortion with three point method.	Understanding	5
5	**Design** the circuit of a series fed class A power amplifier and analyzes it for its efficiency and power dissipation and proves that maximum efficiency is 25%.	Creating	5
6	**Sketch** the schematic of class B push-pull amplifier with complementary symmetry configuration and explain the working of it.	Applying	5
7	**Show** that maximum efficiency of Class B amplifier is 78.5%.	Applying	5
8	**Show** that maximum efficiency of Transformer coupled Class A amplifier is 50%.	Applying	5
9	With a neat diagram **explain** the principle of operation of class B pushpull amplifier.	Understanding	5
10	**Sketch** the schematic of class B push-pull amplifier with complementary symmetry configuration and explain the working of it.	Applying	5
11	**Explain** the operation of low pass RC circuit, and also derive an expression for the output to an exponential input?	Understanding	5

12	**Evaluate** an expression for the percentage Tilt of the output of a highpass circuit with large time constant excited by a symmetrical square wave with Zero average value.	Evaluating	6
13	**Evaluate** an expression for the rise time of the output of a low pass circuit excited by a step input.	Evaluating	6
14	**Discuss** about a low pass RC circuit? Derive an expression of output voltage for square wave input and draw input-output characteristics of this circuit.	Understanding	6
S.No	**QUESTION**	**BLOOMS TAXONOMY LEVEL**	**COURSEOUTCOMES**
15	**Sketch** the high- pass R-C circuit. Derive for step-voltage response of this circuit and show the input-output characteristics of this circuit.	Applying	6
16	**Sketch** the response of an RC high-pass for square wave input	Applying	6
17	**Explain** the response of an RC high-pass filter to behave as a good differentiator.	Understanding	6
18	**Evaluate** the expression for power output and conversion efficiency of a class A series fed amplifier.	Evaluating	6

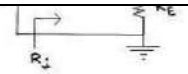
	UNIT-V SWITCHING CHARACTERISTICS OF DEVICES		
1	Explain the phenomenon of "latching" in a transistor switch.	Understanding	6
2	Explain the behavior of a BJT as a switch in electronic circuits. Give an example.	Understanding	6
3	Write a short note on the switching times of transistor.	Applying	6
4	Explain the behavior of a BJT as a switch. Give Applications.	Understanding	6
5	Explain the terms pertaining to transistor switching characteristics. i. Rise time. ii. Delay time.iii. Turn-on time. iv. Storage time v. Fall time. vi. Turn-off time.	Understanding	6
6	Write Short notes on: (a) Diode switching times (b) Switching characteristics of transistors (c) FET as a switch.	Applying	6
7	Explain piecewise linear diode characteristics.	Understanding	6
8	Explain how transistor can be used as a switch in the circuit, under what condition a transistor is said to be	Understanding	7

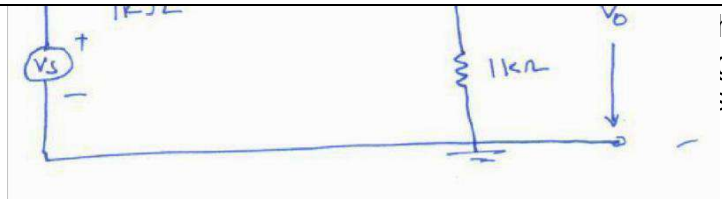
	„OFF" and „ON" respectively.		
9	Discuss how does the temperature affect the saturation junction voltages of a transistor?	Understanding	6
10	Explain how does avalanche multiplication take place in a semiconductor diode?	Understanding	7

GROUP - III (PROBLEMS)

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
	UNIT-I SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS		
1	**Compute** current gain, voltage gain, input and output impedance of the CB amplifier if it is driven by a voltage source of internal resistance Rs=1k.The load impedance is RL=1K. The transistor parameters are hib= 22, hfb= -0.98, hrb=2.9×10−4, hob= 0.5μA/V.	Applying	1
2	**Calc**  r with hie=1.1K, hfe= connected in CE confi	Analyzing	1
3	An Amplifier has a voltage gain of 400, f1=50Hz, f2=200KHz and a distortion of 10% without feedback. **Estimate** the voltage gain, f1f , f2f and Df when a negative feedback is applied with feedback ratio of 0.001.	Understanding	
4	**Calculate** the gain, input impedance, output impedance of voltage series feedback amplifier having A=300, Ri=1.5K,RO=50K Andβ=1/2.	Analyzing	1

5	**Calculate** Ai ,Ri ,Av , Ro, Avs, Ais, Ap. For circuit shown in below the transistor parameters are hic = 1.2KΩ hoc=25 μA/V hrc= 1 ,hfc= -101.	Analyzing	1

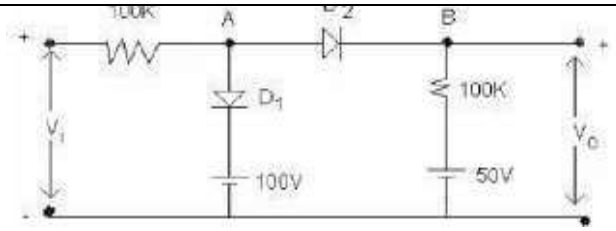
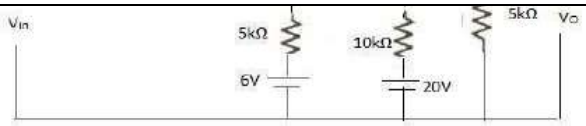
S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
6	 b) If R_L=R_E= 1KΩ and using typical values of h – parameters h_{ie}=1.1KΩ, h_{fe}=50, h_{re}=50, h_{re}=2.5×10^{-4}, h_{oe}=25μA/V. What is the values of R_i.	Evaluating	1
7	**Calculate** the voltage gain for the common source FET amplifier if , rd=100k ohm, gm=300μ, RL=10k ohm.	Analyzing	1
8	We have an amplifier of 60dB gain. It has an output impedance Z0 = 10KΩ. It is required to modify its output impedance to 500Ω by applying negative feedback factor. **Calculate** the value of the feedback factor. Also find the percentage change in the overall gain, for 10% change in the gain of the amplifier without feedback.	Analyzing	1
9	An amplifier with open loop voltage gain AV = 1000±100 is available. It is necessary to have an amplifier whose voltage gain varies by no more than ±0.1 percent. i. **Estimate** the reverse transmission factor β of the feedback network used. ii. Estimate the gain with feedback.	Analyzing	1

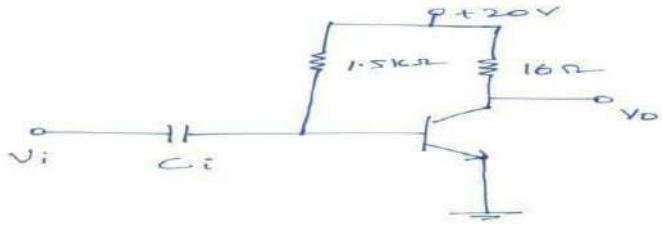
10	 hown gible, s, Rif,	Analyzing	1

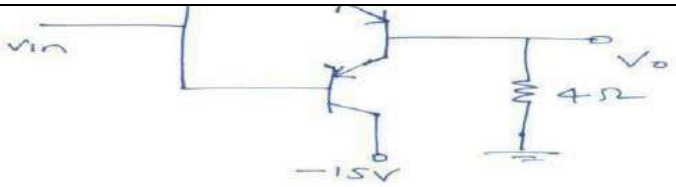
S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
	UNIT –II (BJT AND FREQUENCY RESPONSE		
1	**Estimate** the gain of an amplifier at frequency = 100kHz ,if an Amplifier 3 dB gain is 200 and higher cut-off frequency is 20kHz.	Understanding	3
2	For an amplifier, midband gain is 100 and lower cut-off frequency is 1kHz. **Estimate** the gain of an amplifier at frequency = 20Hz.	Understanding	3
3	**Calculate** gm, rb"e, cb"e and Wβ , At Ic = 1mA and Vce = 10V, a certain transistor data shows Cc= Cb"c=3pf, hfe = 200 and W_T = -500 Mrad/sec.	Analyzing	3
4	**Estimate** the overall upper 3dB frequency fH..If four identical amplifiers are cascaded each having fH = 100kHz .Assuming non interacting stages.	Understanding	3
5	A transistor has hie = 6kΩ and hfe = 224 at Ic = 1mA with fT = 80 MHz and cb"c = 12 pf. **Estimate** gm, rb"e , rbb" and cb"e at room temperature.	Understanding	
	A UNIT-III (MULTIVIBRATORS, CLIPPERS AND CLAMPERS		

1	The fixed-bias bistable multivibrator uses npn transistors with hfe=20.The circuit parameters are Vcc = 12V, VB B= 3V, RC=1KΩ, R1= 5 KΩ, R2 =10 KΩ, VCE(sat) = 0.4V, and VBE (sat) = 0.8V. (a)Estimate the stable state voltages and currents. (b) What is the maximum load the multivibrator can drive, still maintaining one transistor in saturation and the other in cut- off?what is the maximum reverse saturation current ICBO tolerated so that neither of the transistor is at cut-off? If the initial value of ICBO is 10mA at room temperature, what is the maximum temperature at which one device remains off?	Evaluating	6
2	Design fixed bias bistable multivibrator to provide an output with a swing of 10V? b) Design collector coupled fixed-bias Bistable Multivibrator to operate from ±6Vsupply.Given IC (sat) = 1mA, hFE =35. Assume Sitransistor?	Creating	6
3	Design a Schmitt trigger circuit to have VCC =12v, UTP = 6V, LTP = 3V, using two silicon npn transistors with hfe(min) = 60.	Creating	6

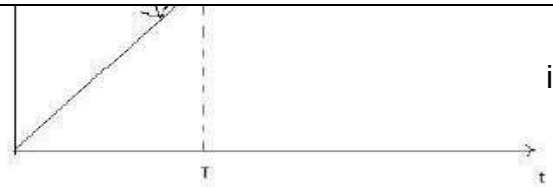
4	Estimate the period of output and the frequency of oscillation of an astable multivibrator with R1 = R2 = 25 KΩ and C1 = C2 = 0.2μF.	Evaluating	6
5	Calculate the input pulse width of mono-stable multivibrator for the design values of RC=2k Ω, RB=10k Ω;C =0.1 μ F , VCC =10 V , VBE(sat)=0.8V.	Analyzing	6
6	In an astable multivibrator circuit shown in the figure 7.4 R1=R2=5kΩ, R3=R4=0.4kΩ and C1=C2=0.02μF. Estimate the time period and frequency of oscillators.	Evaluating	6
7	Design a Schmitt trigger circuit using NPN transistors having hFE(min) =60 . VBE(Cutoff) = 0V, VCE(Sat) = 0.2V and VBE(sat) = 0.7V. Given VCC =8V and o/p swing = 6V, UTP = 3.5V, LTP = 1.5V, R1 = 10K and R2 = 2K. Determine RC1, RC2 and Re.	Creating	6
8	Design an astable multivibrator to generate a 5kHz square wave with a dutycycle of 60% and amplitude 12v. Use NPN silicon transistors having hFE(min) = 70 VCE(Sat) b= 0.3v, VBE(Sat) = 0.7v, VBE(Cutoff) = 0v and RC = 2K. Draw the waveforms seen at both collectors and bases.	Creating	6

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
9	 scale as the two-level linearly from 0 to 200V.	Applying	6
10	**Indi** each circu for th  indicate for the clipping /o versus Vi	Understanding	6
11	A 100V peak square wave with an average value of 0V and a period of 20 ms? **Sketch** the circuit diagram necessary for this purpose. Also, draw the in	Applying put and output wave for	6
	UNIT-IV (LARGE SIGNAL AMPLIFIERS, LINEAR WAVE SHAPING		

1	**Calculate** the following for the given data. i. Power dissipation of each transistor ii. Efficiency A complementary push pull amplifier has capacitive coupled load RL=8Ω, supply voltage of.12V	Analyzing	**6**
2	**Estimate** the value of thermal resistance? If the junction temperature of a transistor is 1250C. The total dissipation at a 250C case temperature is 0.5W and at a 250C ambient temperature, the total dissipation is 0.2W	Evaluating	**5**
3	A series fed class A power amplifier operates from a DC source and is applied with a sinusoidal input signal which generates I_{Bm}=9mA. **Calculate** (i) 	Analyzing	**5**

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOMES
4	**Ca** ma iii. cla as  a r is	Analyzing	**B**
5	**Calculate** the ac power delivered to the load of RL = 2KΩ. For a single transistor operates as an ideal class B power amplifier. If dc current drawn from the supply is 25mA.	Analyzing	5
6	**Calculate** i) Maximum output power ii) Power rating of transistors iii) DC output power .For a complementary symmetry push pull amplifier is operated using Vcc = ±10V and delivers power to a load RL = 5Ω.	Analyzing	5

7	A 10HZ symmetrical square wave whose peak-to-peak amplitude is 2V is applied to a High pass RC circuit whose lower 3-db frequency is 5HZ. **Calculate** and sketch the output waveform?	Analyzing	5

8	**Sk** 0.2 (c) is a  (a) T = igure below	Applying	5
S.No	**QUESTION**	**BLOOMS TAXONOMY LEVEL**	**COURSE OUTCOMES**
9	A class B push pull amplifier supplies power to a resistive load of 12Ω. The output transformer has a turns ratio of 3 : 1 and efficiency of 78.5%. **Calculate** : i) Maximum power output ii) Maximum power dissipation in each transistor iii) Maximum base and collector current for each transistor. Assume hfe =25 and VCC = 20V.	Analyzing	5
	UNIT-V (SWITCHING CHARACTERISTICS OF DEVICES		
1	A transistor has fT = 50 MHz, 4FE=40, Cb0c=3PF and operates with Vcc=12V and Rc=500W. The transistor is operating initially in the neighborhood of the cut-in point. **Calculate** the base current that must be applied to drive the transistor to saturation in 1μ sec?	Analyzing	6
2	**Design** a high speed CE transistor switch operating with two power supplies Vcc=15v and –Vbb = -15V. The transistor is operating at Ic=6mA, Ib = 0.5mA. the static current gain hfe of the transistor is25. Vbe(sat) =0V and R2 = 4R1. Determine the values of the three resistors Rc, R1 and R2	Creating	6
3	**Calculate** the minimum value of Ib to keep the transistor in saturation when it is in its ON state? Consider a transistor switch in CE configuration operating with Vcc=18V and _Vbb= 0v and Vce(sat) = 0V.the static current gain hfe of the transistor is 50.	Analyzing	6

4	A silicon transistor is operated at room temperature in the CE configuration. The supply voltage is 6 V, the collector-circuit Resistance is 400Ω and the base current is 20 percent higher than the minimum value required driving the transistor into saturation.a Assume the following transistor parameters: Ico=-5μA, IEO=-2μA, hFE=100, and r bb_ =250. **Calculate** V BE (Sat) and V CE (Sat).	Analyzing	6

Unit-1

Unit 1:

1) Critical capacitance with smallest equivalent resistance that determines the lower cut off of CB amplifier is

a) I/P coupling capacitor

b) Emitter bypass capacitor if c1 = c2
c) c2 output coupling capacitor

d) None.

2).resultant phase shift of odd no of CE amplifier stages at mid band frequency is a)3600

b) 1800
c) 450
d) 900

3).he miller input capacitance in CB AMP IS

a) large compared to miller capacitance in CE
b) very large because of +ve voltage gain in CB
c) small because of +ve voltage gain in CB
d) is not negligible compare to other capacitance

4) Identify the correct statement regarding the voltage gain of a CE transistor amplifier a) it increases with increase in ac load R

b) it is independent of ac load R & is large
c) it decreases with increase in ac load R
d) it is always approximately unity

5) Identify the incorrect statement
[d]

a) frequency distortion in an amplifier is mainly due to the reactive component circuit
b) amplitude distortion is also referred to as non-linear distortion

c) distortion in amplifier due to unequal phase shifts at different frequencies is called delay distortion

d) phase shift distortion is same as frequency distortion
ans: [D]

6) i/p &o/p capacitors in a transistors amplifier are not referred to as [a]

a) inter electrode capacitors b) coupling capacitors

c) blocking capacitors

d) dc de-coupling capacitors ans : [A]

7) CB amplifier of BJT is similar in behaviour with following FET configuration [a]

a)common gate amplifier b) common drain amplifier C) common source amplifier
d)swamped source resistor amplifier ans:[A]

8) The miller i/p capacitance in CB amplifier

[c]

a) Is large compared to miller capacitance in CE
b) is very large because of +ve voltage gain in CB

c) is small because of +ve voltage gain in CB

d) not negligible compared to other
capacitance ans: [C]

9) CE is the capacitance of forward biased junction & is
therefore [c]

a) independent of collector
current b) much lager than Cc

c) mainly diffusion capacitance
d) mainly transition
capacitance ans: [C]

10) dissipation capability of a transistor is defined as
[a]

a) capability to launch heat generated into the surroundings
b) deviation in power delivered to load resistor
c) capability to withstand the variation in dc power at operating power
d) deviation in o/p & i/p signal wave shapes
ans: [A]

11) phase difference between o/p voltage &i/p voltage of a CC amplifier at mid band
frequencies [b]

a) 1800
b) 00 c)
450 d)
900 ans :
[B]

12) major draw back of Darlington transistor pair
[d]

a) low current gain compared to single emitter follower
b) dependence of Av on transistor selected
c) low i/p impedance compared to single emitter follower
d) dependence of H -parameters on quiescent conditions

ans: [D]

13) cascade amplifier is 2- transistor combination has

a) collector of first transistor is connected to the base of second transistor
b) collector current of first transistor is same as emitter current of second transistor
c) emitter current of first transistor is same as the collector current of the second transistor
d) none

14) resultant phase shift of odd no of CE amplifier stages at mid band frequency is
a) 3600

b) 1800
c) 450
d) 900

15) major drawbacks of Darlington transistor pair is

a) low current gain compared to single emitter follower
b) dependence of AV on transistor selected condition
c) low i /p impedance compared to single emitter follower
d) dependence of h-parameters on quiescent point.

16) Resultant current gain of a Darlington pair individual current gain of hfe
is [d]

a) hfe/2
b) hfe c)
2hfe d)
hfe2 ans:
[D]

17) 2-stage rc coupled amplifier is configured as
[a]

a) 2 capacitively coupled CE stages cascaded
b) a CE stage capacitively coupled to a CC stage
c) 2 capacitively coupled CB stages cascaded.

d) 2 capacitively coupled CC stages cascaded
ans: [A]

18) 2-transistor cascade with both collectors tied together & emitter of the transistor connected to the base of the transistor is referred to as [a]

a) Darlington pair
b) CE &CC cascade
c) cascade amplifier
d) differential pair
ans: [A]

19) the i/p impedance of cascade amplifier is [b]
a) hic
b) hie

c) infinity

d) hib
ans: [B]

20) type of inter stage coupling resulting in highest overall gain [c]

a) direct coupling
b)inductive coupling
c) RC coupling

d) transistor coupling ans : [C]

21) main disadvantage of Darlington pair amplifier is

[d]

a) low i/p impedance
b) low current gain

c) high o/p impedance d)high leakage current ans: [D]

22) Major advantage of boot strap Darlington pair over single Darlington pair is
(a) High overall Av with proper DC biasing

(b) increased Ai irrespective of bias condition

(c) high i/p impedance irrespective of bias condition

(d) increased Ai depending upon the bias condition Ans: (c)

Feed Back Amplifiers

1. When negative voltage feedback is applied to an amplifier, its voltage gain .....

(i) is increased
(ii) (ii) is reduced
(iii) remains the same
(iv) none of the above

2. The value of negative feedback fraction is always .....

(i) less than 1
(ii) (ii) more than 1
(iii) equal to 1
(iv) (iv) none of the above

3. If the output of an amplifier is 10 V and 100 mV from the output is fed back to the input, then feedback fraction is .....

(i) 10
(ii) 0.1
(iii)0.01

(iv) (iv) 0.15

4. The gain of an amplifier without feedback is 100 db. If a negative feedback of 3 db is

applied, the gain of the amplifier will become

.....

(i) 101.5 db
(ii) 300 db
(iii) 103 db
(iv) 97 db

5. If the feedback fraction of an amplifier is 0.01, then voltage gain with negative voltage feedback is approximately .....

(i) 500
(ii) 100
(iii) 1000
(iv) 5000

6. A feedback circuit usually employs ..... network.

(i) resistive
(ii) capacitive
(iii) inductive

(iv) none of the above

7. The gain of an amplifier with feedback is known as ..... gain.

(i) resonant (ii)
open loop (iii)
closed loop

(iv) none of the above

8. When voltage feedback (negative) is applied to an amplifier, its input impedance .....
(i) is decreased

(ii) is increased
(iii) remains the same
(iv) none of the above

9. When current feedback (negative) is applied to an amplifier, its input impedance .....

(i) is decreased (ii) is increased
(iii) remains the same

(iv) none of the above

10. Negative feedback is employed in .....
(i) oscillators (ii) rectifiers

(iii) amplifiers (iv) none of the above 11. Emitter follower is used for .....

(i) current gain
(ii) impedance matching
(iii) voltage gain (iv) none of the above

12. The voltage gain of an emitter follower is ...

(i) much less than 1
(ii) approximately equal to 1
(iii) greater than 1 (iv) none of the above

13. When current feedback (negative) is applied to an amplifier, its output impedance .....

(i) is increased
(ii) is decreased
(iii) remains the same
(iv) none of the above

14. Emitter follower is a ..... circuit.

(i) voltage feedback
(ii) current feedback

(iii) both voltage and current feedback (iv) none of the above

15. If voltage feedback (negative) is applied to an amplifier, its output impedance .....

(i) remains the same

(ii) is increased (iii) is decreased
(iv) none of the above

16. When negative voltage feedback is applied to an amplifier, its bandwidth .....

(i) is increased (ii) is decreased
(iii) remains the same

(iv) insufficient data

17. An emitter follower has ..... input impedance.
(i) zero (ii) low

(iii) high (iv) none of the above

19. The output impedance of an emitter follower is .....

(i) high (ii) very high
(iii) almost zero (i

20. The approximate voltage gain of an amplifier with negative voltage feedback (feedback fraction being mv) is .....

(i) 1/mv (ii) mv
(iii) 1/1 v + m

(iv) 1 − mv

22. In the expression for voltage gain with negative voltage feedback, the term 1 + Am mv is

known as .....

(i) gain factor (ii) feedback factor

(iii) sacrifice factor (iv) none of the above

23
25. Feedback circuit ..... frequency.
(i) is independent of

(ii) is strongly dependent on
(iii) is moderately dependent
on (iv) none of the above

26. The basic purpose of applying negative voltage feedback is to .....

(i) increase voltage
gain (ii) reduce
distortion

(iii) keep the temperature within limits

(iv) none of the above

27. If the voltage gain of an amplifier without feedback is 20 and with negative voltage feedback it is 12, then feedback fraction is .....

(i) 5/3 (ii) 3/5 (iii) 1/5 (iv) 0.033

28. In an emitter follower, we employ ..... negative current feedback.

(i) 50% (ii) 25% (iii) 100% (iv) 75%

29. An amplifier has an open loop voltage gain

of 1,00,000. With negative voltage feedback,

the voltage gain is reduced to 100.

What is the sacrifice factor ?

(i) 1000 (ii) 100

(iii) 5000 (iv) none of the above

30. In the above question, what will happen to circuit performance ?

(i) distortion is increased 1000 times

(ii) input impedance is increased 1000 times (iii) output impedance is increased 1000 times

(iv) none of the above

1.(ii) 2. (i) 3. (iii) 4. (iv) 5. (ii)

6. (i) 7. (iii) 8. (ii) 9. (i) 10. (iii)

11. (ii) 12. (ii) 13. (i) 14. (ii) 15. (iii)
16. (i) 17. (iii) 19. (iv) 20. (i)
22. (iii) 25. (i)
26. (ii) 27. (iv) 28. (iii) 29. (i) 30. (ii)

Unit 2 Frequency Response of BJT and FET

1) identify the correct
relationship a) f alpha ~ f beta

b) f beta >> f alpha
c) f alpha ~ ft

d) f alpha >> f beta

2) lower cutoff &higher cutoff frequency of rc coupled amplifier
are a) both zero

b) both infinity

c) zero & infinity respectively
d) similar to those of CE stage

3) voltage gain of an amplifier reduces to 1/(root 2)its max
a) break frequency
b) miller frequency

c) half power frequency
d) cutoff frequency

4) rce >> rbe condition is applicable in hybrid -pie equivalent of CE amplifier because
a) collector base junction is reverse biased & emitter base junction is forward biased
b) o/p R is always much larger than i/p R

c) b is the internal base terminal

d) base region is extremely tin compared to emitter & collector terminals

5) expression for short circuit current gain bandwidth
[d]

a) gm/2pie hfe (ce+cc)
b) gm/(ce+cc)

c) gm/ hfe
(ce+cc)

d)gm/2pie
(ce+cc)

6) identify the expression for voltage gain CE & fet amplifier at low frequency [c]
a) -gm rd Rl /(rd + Rl)

b) gm rd Rl / (rd +Rl+ gm rd Rl)
c) gm rd Rl /(rd + Rl)

d) Rl || rd / (1+ gm rd)

7) Resultant phase shift of even no of CB amplifier stage at frequency below lower cutoff frequency [d]

a) always a multiple of 2 pie

b) product of phase shift introduced by individual stages c) always 1800

d) sum of the phase shifts introduced by individual stages

8) Identify the incorrect statement for a high frequency hybrid pie model of a BJT is [a]
a) high frequency hybrid pie capacitances can be expressed in terms of low frequency hparameters
b) capacitance between collector & base terminal of a BJT is called overlap -diode capacitance
c) ' B' represent internal base terminal
d) high frequency hybrid pie conductances can be expressed in terms of low frequency hparameters.
9) identify false statement [c]

a) fbeta & Ic exhibits a peak value of a particular ic.

b) unity gain band width Ft is the function of Ic
c)ft & Ic both are functions of f beta

d) Ft variation with Ic is similar to hfe variation with T
ans: [C]

10) during the mid band frequency the gain of amplifier is [d] a) 1/(root 2) times Max value

b) min
c)unity

d)
constant
ans: [D]

11) bandwidth of an amplifier with lower & higher cutoff frequency Fl & Fh .& quantity factor Qis [a]

a) Fh - F l
b) Fh/ q
c) (Fh-Fl)/1.414
d) q-Fl
ans: [A]

12) identify the expression for voltage gain CD & fet amplifier at low frequency
[b]

a) -gm rd Rl /(rd + Rl)
b) gm rd Rl / (rd +Rl+ gm rd Rl)
c) gm rd Rl /(rd + Rl)
d) Rl || rd / (1+ gm rd)

ans: [B]

13) the transconductance gm of a transistor depend
on [b]

a) temperature

b) operation
frequency c) CE
voltage

d) C c ans
: [B]

14) ft for a ce amplifier is defined as
[b]

a) the frequency at which the CE current gain falls to half its Max value

b) frequency at which CE current gain becomes unity
c) frequency at which CE voltage gain falls to half its Max value
d) frequency at which CE voltage gain becomes unity

15) the capacitance determining the corner frequency lag network at the i/p of CE amplifier
is [b]

a) miller i/p
capacitor b) c wiring

c) external capacitor at the
base d)cbe

ans: [B]

16) if Av is the voltage gain of an amplifier in db & Ai is its current gain in db then power gain of amplifier in db is [d]

a) Av- Ai b) Av/ Ai
c)10log 10 Av/ Ai
d) Av+Ai

ans : [D]

17) at frequency below lower cut off frequency in CE amplifier coupling capacitor at the base of the amplifier form an LPF [b]

a) with emitter
resistance b) with i/p
resistance

c) with o/p resistance

d) with base
resistance ans: [B]

18) advantage of impedance type inter stage coupling
is [c]

a) very wide band & frequency independent gain
curve b) flat response of frequency in mid band
region

c) no dc voltage drop across collector load

d) no requirement of bulky components all
frequency ans: [C]

19) resultant phase shift of odd number of CE amplifier stages at mid band frequency is [b] a) 3600

b)180
0 c)
450 d)
900

20) lower cutoff & higher cut off frequency of an rc coupled amplifier are

[c]

a) both zero
b) both infinity
c) similar to of CE stage
d) zero& infinity
ans: [C]

21) higher cutoff frequency of transistor amplifier is mainly because of [a]

a) inter electrode capacitance b) bypass capacitance

c) blocking capacitance
d) coupling capacitance

22) ratio of slopes of the gain curve of an amplifier below lower cutoff frequency & above cutoff frequency is [b]

a) 3

b) unity
c)2

d) 6

ans: [B]

23) the capacitors that are short circuited at low frequencies in CE amplifier are [d]

a) o/p coupling capacitors

b) i/p coupling capacitors
c) emitter bypass capacitors

d) inter electrode
capacitor ans:[B]

24) the critical capacitance that determines the overall cut off frequency of an amplifier is the one which sees an equivalent resistance [a]

a) of minimum value
b) of Max value
c) of infinity value

d) equals to its reactance value at that
frequency ans: [A]

25) distortion in amplifiers due to unequal amplitude gains at different frequencies is referred to as [c]

a) phase shift
distortion b) amplitude
distortion c) frequency
distortion d) delay
distortion ans : [C]

26) slope of the gain curve of an amplifier below cut off frequency is

[a]

a) -20 db decade

b) 6 db
decade c)-6
db decade

d) 20 db
decade ans : [
A]

28) the CE short circuit current gain in db at frequency f = Ft is
[d]

a) hfe/1.414
b) unity

c) hfe
d)zero

ans: [D]

29). Phase difference between o/p and i/p voltages of a transistor amplifier at lower cut off frequencies is

a)180 b) 45 c) 0 d) 90

Ans: (b)

30) All frequencies below lower cut off frequency in a CE amplifier, the coupling capacitor at the base of the amplifier forms a LPF

a)with RE b)Rip c)RB d)Rop
Ans: (b)

Unit 3

Multivibrators Non Linear Wave Shaping

1. A circuit which can oscillate at a number of frequencies is called a __.
2. Basically there are __ types of multivibrators. They are __, __ and __.
3. Resistive coupling is called __ coupling and capacitive coupling is called ___ coupling.
4. A __ multivibrator is the basic memory element.
5. In bistable multivibrators, the coupling elements are __.
6. In monostable multivibrator, the coupling elements are __.
7. In astable multivibrator, the coupling elements are __.

8. A __ circuit is one which can exist indefinitely in either of its two stable states and which can be induced to make an abrupt transition from one state to the other.

9. A bistable multivibrator is also called __ , __, __, ___ and __.

10. A __ multivibrator is used to perform many digital operations such a counting and storing of binary information. It is also used in the generation and processing of pulse type waveform.

11. A __ of a binary is one in which the currents and voltages satisfy Kirchhoff's laws and are consistent with the device characteristics and in which, in addition, the condition of loop gain being less than unity is satisfied.

12. A __ state of a binary is one in which the device can remain permanently.
13. Loop gain will be __ if either of the two devices is below cut-off or if either device is in saturation.
14. In the stable state, the loop gain is __
15. During transition, the loop gain is __

16. The change in collector voltage resulting from a transition from one state to the other is called __ and is given by ___.

17. __ reduces the output swing.

18. The flip-flop circuit components must be chosen so that under the maximum load which the binary drives, one transistor remains in ___ while the other is __.

19. A constant output swing and a constant base saturation current can be obtained by clamping the collectors to an auxiliary voltage V __ Vcc through the diodes D1 and D2.

20. The diodes used in a bistable multivibrator to maintain a constant output swing are called __ diodes.
21. The interval during which conduction transfers from one transistor to another is called the __.
22. The transition time may be reduced by shunting the coupling resistor with __ called the __
23. Commutating capacitors, also called __ or __ capacitors are used to increase the speed of operation.
24. The smaller allowable interval between triggers is called the __ of the flip-flop.
25. The reciprocal of the resolving time of the flip-flop is the __ at which the binary will respond.

26. The additional time required for the purpose of completing the recharging of capacitors after the transfer of conduction is called the __.

27. The sum of the transition time and the settling time is called the __.
28. If the commutating capacitors are too small, the __ time is increased and if they are too large the ___ time increased.

29. The resolution time of a binary can be improved by a) __ , b) __ and c) ___.
30. The disadvantages of non-saturated binary are a) ___, b) ___ and c) ___.
31. The application of an external signal to induce a transition from one state to the other is called __.

1. __ is the process of cutting and removing a part of the waveform.

2. __ circuits are used to select for transmission that part of an arbitrary waveform which lies above or below some particular reference voltage level.

3. Clipping circuits are also called __ or __ limiters, __ selectors or ___.
4. Clipping circuits do not require __ elements.

5. In the simple clipping circuits, the external resistance R is selected to be the __ of the diode forward and reverse resistance, i.e. R = __

6. The use of the diode as a series element has the disadvantage that __
7. The use of the diode as a shunt element has the disadvantage that __
8. A transistor has __ nonlinearity which can be used for clipping purpose.
9. A diode has __ nonlinearity which can be used for clipping purposes.
10. Single ended clipping is also called __ clipping.
11. Double ended clipping is also called __ clipping.
12. In a diode, the nonlinearity occurs when it goes from _- to ___

13. In a transistor, the nonlinearities occur when a) the device goes from __ region to __ region and b) the device goes from __ region to __ region.

14. the emitter coupled clipper is a __ clipper. It is an emitter coupled __ amplifier.
15. A clipping circuit may be used to convert a sine wave into a __ wave.

16. A __ circuit is one, which may be used to mark the instant when an arbitrary waveform attains some particular reference level.

17. Comparators may be __ comparators or __ comparators.
18. __circuits may be used as comparators
19. Clipping circuits are __ comparators.
20. The Schmitt trigger is a __ comparator.
21. Regenerative comparators employ __feedback.
22. In a __ clipper, when the diode is OFF, the output follows the input.
23. In a ___ clipper, when the diode in ON, the output follows the input.
24. Clipping circuits differ from comparators in that __.
25. An example of a non-regenerative comparator is a __.
26. An example of a regenerative comparator is a __
27. The Schmitt trigger comparator generator generates approximately __
28. The blocking oscillator comparator generates ___

29. ___ are used to fix the positive or negative extremity of a periodic waveform at some constant reference level.

30. Under steady-state condition, the clamping circuits restrain the __ of a waveform going beyond VR.

UNIT4 Large Signal Amplifiers and Linear Wave Shaping

1) Non-linear distortion is maximum in
a) class

B mode

b) class A mode
c) class AB mode
d) class C mode

2) final stage of multistage amplifier is generally a) a
pre-amplifier

b) a voltage post
amplifier c) a power
amplifier

d) a microphone amplifier

3) Max conversion efficiency of a series fed class A power amplifier is
a) 75

b) 100
c) 50
d) 25

4) even harmonics are not present in the o/p of
a) class A transformer coupled amplifier
b) class c amplifier
c)class A amplifier

d) class B push pull amplifier

5) Even harmonics in the o/p are connected in push - pull configurations only if

[a]

a) both transistors are perfectly matched
b) both NPN & PNP transistors are used
c) A phase inversion is not used at inputs of 2 transistors
d) two power supplies are used
ans:[A]

6) i/p signals swing in class A power amplifier is restricted to
[d]

a) a small portion around Q point in active region b) entire portion around Q point in saturation

c) entire portion around Q point in cutoff d) entire portion around Q point in active ans: [D]

7) transistor in class C amplifier is based beyond cutoff region to [b]

a) ensure reduced distortion of o/p signal

b) ensure conduction angle of less than 1800

c) ensure conduction angle of transistor for entire i/p
cycle d) ensure o/p wave shape to the replica of i/p wave
shape ans: [B]

8) increased conversion efficiency in class B over class A operation is mainly due to
[b]

a) elimination of all higher harmonics
b) elimination of dc current in the
load c) usage of single power supply

d) elimination of cross over
distortion ans: [B]

9). The frequency at which CE is short circuit current gain becomes unity is
represented by__fT_____

71. Non linear distortion is maximum in
a) Class B mode a) Class A mode

a) Class AB mode d) a) Class C mode
Ans: (b)

10). Even harmonics are not present in the o/p of Class B push pull amplifier.

11) Cross over distortion in class B amplifier is due to
(a) finite cut-off voltage of the two transistors

(b) non-identical behaviour of the two transistors

(c) elimination of two power supplies in the circuit

(d) elimination of even harmonics in the
o/p impedance

1. A Network which can be mathematically described by linear constant coefficient different equations is called a __.

2. The process whereby the form of a non-sinusoidal signal is altered by transmission through a linear network is called __.

3. Except for the __ signal, no other signal can preserve its form when it is transmitted thorough a linear network.

4. A __ circuit passes low frequency signals and attenuates high frequency signals.
5. The frequency at which the gain is __ of its maximum value is called the cut-off frequency.
6. The lower cut-off frequency of a low pass circuit is __.

7. The upper cut-off frequency of a high pass circuit is __ and is equal to its __ and is given by f2 = __.

8. At very high frequencies, the capacitor acts almost as a __ and at very low frequencies, the capacitors acts almost as an __.

9. The capacitor __ the dc signal.
10. At the cut-off frequency of the RC circuit, the ___ reactance is equal to the __ and the gain is ___.

11. A signal which maintains the value zero for all times t < 0, and maintains the value V for all times t ≥ 0, is called a __.

12. The expression for the output of a low pass circuit excited by a step input is v0 = ___.

13. __ is defined as the time taken by the output to rise from 10% to 90% of its final steady-state value for a step input.

14. The rise time of a waveform is directly proportional to the __ and inversely proportional to the __.

15. The rise time tr of a waveform is given by tr = ____.

16. In an RC circuit, for a step input, if the initial slope of the output voltage across the capacitor is maintained constant, the output reaches its final value in one ___.

17. For the most applications, the steady-state condition is assumed to be reached at t =____.
18. A pulse may be treated as the sum of a __ followed by a delayed __ of the same amplitude.

19. A pulse shape is preserved when it is passed through a low-pass circuit, if the 3-dB frequency is approximately equal to the __ of the pulse width.

20. A periodic waveform which maintains itself at one constant level V' with respect to ground for a time T1, and then changes abruptly to another level V" and remains constant at that level for a time T2, and repeats itself with a period T=T1 +T2 is called a __.

21. Under ___ conditions, the capacitor in the RC circuits charges and discharges to the same level in each cycle. So the shape of the output waveform is fixed.

22. A waveform which is zero for t < 0 and which increases linearly with time for t > 0 is called a ___ or ___.

23. At the end of a ramp input, the difference between the input and the output divided by the input is called the ___.

24. If two stages whose individual rise times are tr1 and tr2 respectively are cascaded, the rise time of the output waveform will be tr = ____.

25. A low pass circuit acts as __ if the time constant of the circuit is very large in comparison with the time required for the input signal to make an appreciable change.

26. For an RC low-pass circuit to act as an integrator, it is necessary that RC ___ where T is the period of the sine wave.

27. A __ attenuates all low frequency signals and transmits only signals of high frequency.
28. The lower cut-off frequency of a high pass circuit is ___ and is given by f1 = __.
29. The upper cut-off frequency of a high pass circuit is ___ and hence its bandwidth = ___.

30. The capacitor in the high-pass circuit blocks the dc component of the input from going to the output. Hence it is called a __.

Unit 5 **Switching characteristics of Devices**

1. The static resistance of a diode is the ratio of _- to __

2. the dynamic resistance of a diode is the ratio of __ to __

3. When a diode is reverse biased, it acts as an __ switch, and when it is forward biased, it acts as a __ switch.

4. In the steady state condition, the current which flows, through the diode is a __ current.
5. The __ current results from the gradient of the minority carriers.
6. At large current amplitudes, the diode behaves as a combination of a __ and __.
7. At intermediate currents, the diode behaves as a __ , ___ and a __.
8. At low currents, the diode is represented by a parallel combination of a __ and __.

9. The forward recovery time tfr is the time difference between the __ and the time when this voltage reaches and remains within __.

10. The __ recovery time of a diode does not usually constitute a problem.

11. The time required for the stored minority charge to become zero after the application of the reverse voltage is called the __.

12. The time which elapses between the instant when the stored minority charge becomes zero and the time when the diode has nominally recovered is called the __.

13. A large signal approximation which often leads to a sufficient accurate engineering solution is the __ representation.

14. Once breakdown occurs, the diode current can be controller only by the resistance of the ___.
15. The breakdown due to thermally generated carriers is called the __ breakdown.
16. The breakdown due to existence of strong electric fields is called the __ breakdown.
17. __ breakdown occurs at voltages below 6 V.
18. The operating voltages in __ breakdown are from several volts to several hundred volts.

19. The breakdown voltage of a Zener diode __with temperature where as the breakdown voltage of an avalanche diode __ with temperature.

20. The breakdown voltage for a particular diode depends on the __ levels in the junction.

21. When a transistor is in saturation, junction voltages are __ but the operating currents are __.
22. When a transistor is in cut off, the junction voltages are ___ but the currents are __.
23. For Ge, Vv = ____ . For Si, Vv = _____. For avalanche diodes, Vv=___.

24. The time required for the current to rise to 10% of its saturation value after the application of the input is called the ___.

25. The time required for the current to rise from 10% to 90% of the saturation value is called the __.
26. The sum of the delay time and the rise time of a transistor is called the __ time.

27. The interval which elapses between the transition of the input waveform and the time when Ic has dropped to 90% of saturation current is called the __.

28. The time required for Ic to fall from 90% to 10% of its saturation level is called the __.
29. The sum of the storage time and the fall time of a transistor is called the __ time.
30. A transistor can operate in three regions : ___, ____ and ___.

HOLY MARY INSTITUTE OF TECHNOLOGY & SCIENCE

(COLLEGE OF ENGINEERING)
Bogaram (V), Keesara (M), R.R. Dist – 501 301

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

HAND BOOK

PROGRAMME: B.Tech ECE AC:YEAR: **2018-2019**	DEGREE: **B.TECH II YEAR**
COURSE: **ENVIRONMENTAL SCIENCE & TECHNOLOGY**	SEMESTER: **I** CREDITS: 0 COURSE COORDINATOR: Mr.S.Prakash
COURSE CODE: MC300ES REGULATION:**R16**	COURSE TYPE: **REGULAR**
COURSE AREA/DOMAIN:	CONTACT HOURS: 3 hours/Week.
CORRESPONDING LAB COURSE CODE : NILL	LAB COURSE NAME: NILL

COURSE OVERVIEW:

As per the Supreme Court direction the Union of India has been included Environmental Education in the curriculum right from the school stage to college/University level since 1988. The University Grants Commission decided to address the issue of Environmental Studies by introducing a basic course on Environment at the undergraduate level. The prime objective for the inclusion of the subject irrespective to all the branches in engineering courses is to make everyone environment literate. The degradation of the environment is linked with the development process. The development should be in a sustainable way which not only meets the present needs but also should compromise the ability of future generations to meet their own needs. Environmental Science is an interdisciplinary academic field that integrates Physical and biological sciences (including physics, chemistry, biology, soil science, geology and geography) to the study of the environment and the solutions of environmental problems. The course description is: multidisciplinary in nature. The course content is divided in to five Units, Ecosystems, Natural Resources, biodiversity and biotic Resources, Environmental Pollution and Control technologies and Environmental Policy, Legislations & EIA for the convenience of academic teaching and learning process

PRE-REQUISITES:

Level	Credits	Periods/ Week	Prerequisites

UG	4	4	Knowledge of disaster management and its mitigation

MARKS DISTRIBUTION:

Session Marks	University End Exam Marks	Total Marks
Mid Semester Test • There shall be two midterm examinations. • Each midterm examination consists of subjective type and objective type tests. • The subjective test is for 10 marks of 60 minutes duration. • Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. • The objective type test is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. • First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. **Assignment** • Five marks are earmarked for assignments. • There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course.	75	100

EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	80minutes	100
2	II Mid Examination	80minutes	100

COURSE OBJECTIVES & OUTCOMES:

Course Objectives	Course Outcomes	Blooms Level
Understanding the importance of	Understand the scarcity of natural	BL1,2

ecosystems, ecological balance for sustainable development.	resources and will be able to replace them with alternative energy sources for the sustainability of the environment, society and economy.	
Recognize the significance of Natural resources, their classification and alternative energy sources for the sustainability of the environment, society and economy by appropriate maintenance of natural resources.	Recognize the types of biodiversity along with the Values and conservation biodiversity and know about the biogeographically regions	BL 1,2,4
Understand the biodiversity and types of biodiversity along with the Values and conservation of biodiversity	Categorize the types of environmental pollution and the various treatment technologies for the diminution of environmental pollutants and contaminants.	BL 1,2,3
Categorize the types of environmental pollution and the various treatment technologies for the diminution of environmental pollutants and contaminants.	.Summarize the global environmental issues and to create awareness about the international conventions and protocols for extenuating global environmental problems.	BL 1,2,5
Summarize the global environmental issues and to create awareness about the international conventions and protocols for extenuating global environmental problems.	Understand the importance of Environmental legislation policies	BL 3,5,6
Understand the sustainable development concept and importance of green building understand the importance of EIA,EIS and EMP.	Understand the importance of sustainable development concept of green building	BL2,4,6

BLOOMS LEVEL (BL)

BL 1: Remember / knowledge BL2: Understanding BL3: Apply

BL 4: Analyze BL 5: Evaluate BL 6: Create

HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by	Blooms Level
A	An ability to apply knowledge of mathematics, science and engineering	S	Solving Gate and Text book Problems	APPLY
B	An ability to design and conduct experiments, as well as to analyze and interpret data	S	Solving Gate and Text book Problems	APPLY
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	H	Assignment and Gate questions	Apply and Analyze
D	An ability to identify, formulate and solve engineering problems.	S	Class Test & Group Activity	Apply
E	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	S	Mini and Micro Projects	Apply
F	An ability to understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.	N	--	--
G	An ability to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.	H	Mini / Micro Projects and GATE questions	Analyze and Justify
H	An understanding of professional and ethical responsibility.	N	--	--
I	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	S	Class Test & Seminar	Analyze
J	An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and	S	Seminars	Understand & Analyze

	receive clear instructions.			
K	An ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.	S	Mini and Micro Projects	Apply
L	Recognition of the need for, and an ability to engage in life-long analyzing.	S	Group Activity	Analyze
M	An ability to design and implement projects in the areas including Signal Processing, Microwaves, Communication Systems, IC Technology and Embedded Systems.	H	Mini and Micro Projects	Apply
N	An ability to use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.	S	Seminars & Projects	Analyze & Apply

N = None S = Supportive H = Highly Related

SYLLABUS:

ENVIRONMENTAL SCIENCE & TECHNOLOGY
II Year B.Tech. I Sem

UNIT-I :
Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bio-accumulation, Bio-magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II:
Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.

Mineral resources:
use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies .

UNIT-III:
Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife,
man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.
Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.
Noise Pollution: Sources and Health hazards,
standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.
Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.
Global Environmental Problems and Global Efforts:
Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.
UNIT-V:
Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste m anagement and handling rules, hazardous waste management and handling rules.
EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).
Towards Sustainable Future:
Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.
SUGGESTED TEXT BOOKS:
1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4 th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

1. .

COURSE PLAN:

Lecture Number	Unit	Topics to be Covered	Reference
1	I	**Introduction**	A1,A3
2	I	Definition, Scope and Importance of ecosystem.	A1,A3
3	I	Classification of ecosystem	A1,A3
4	I	Classification of ecosystem	A1,A3
5	I	Structure of ecosystem	A1,A3
6	I	function of an ecosystem	A1,A3
7	I	Food chains	A1,A3
8	I	food webs	A1,A3
9	I	ecological pyramids	A1,A3
10	I	Flow of energy	A1,A3
11	I	Biogeochemical cycles	A1,A3
12	I	Biogeochemical cycles	A1,A3
13	I	Biogeochemical cycles	A1,A3
14	I	Bioaccumulation	A1,A3
16	I	Biomagnification	A1,A3
16	I	ecosystem value, services	A1,A3
17	II	Classification of Resources	A1,A3
18	II	Living and Non-Living resources	A1,A3
20	II	floods and droughts	A1,A3
21	II	Dams: benefits and problems	A1,A3
22	II	Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources	A1,A3
23	II	Land resources: Forest resources	A1,A3
24	II	Energy resources: growing energy needs	A1,A3
25	II	renewable and non renewable energy sources	A1,A3
26	II	use of alternate energy source, case studies	A1,A3
27	III	Introduction, Definition	A1,A3
28	III	genetic, species and ecosystem	A1,A3
29	III	diversity	A1,A3

30	III	Value of biodiversity; consumptive use	A1,A3
31	III	productive use, social, ethical, aesthetic and optional values	A1,A3
32	III	India as a mega diversity nation	A2
33	III	Hot spots of biodiversity	A2
34	III	Threats to biodiversity: habitat loss, poaching of wildlife	A2
35	III	man-wildlife conflicts	A2
36	III	conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act	A2
37	IV	Environmental Pollution:Classification of pollution	A2
38	IV	Air Pollution: Primary and secondary pollutants Automobile and Industrial pollution Ambient air quality standards	A2
39	IV	Water pollution: Sources and types of pollution, drinking water quality standards	A2
40	IV	Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil	A2
41	IV	Noise Pollution: Sources and Health hazards, standards	A2
42	IV	Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management	A2
43	IV	Pollution control technologies: Wastewater Treatment	A2
44	IV	Overview of air pollution control technologies, Concepts of bioremediation	A2
45	IV	Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS)	A2
46	IV	Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol	A2
47	V	Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act	A2
48	V	Wild life Act, Municipal solid waste management and handling rules	A2
49	V	biomedical waste management and handling rules	A2
50	V	hazardous waste management and handling rules	A2
51	V	EIA: EIA structure, methods of baseline data acquisition	A2
52	V	Overview on Impacts of air, water, biological and Socio-economical aspects	A2
53	V	Strategies for risk assessment, Concepts of Environmental Management Plan (EMP)	A2
54	V	Sustainable Future: Concept of Sustainable Development	A2

55	V	Population and its explosion,Crazy Consumerism	A2
56	V	Environmental Education, Urban Sprawl, Human health, Environmental Ethics	A2
57	V	Concept of Green Building, Ecological Foot Print, Life Cycle	A2

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objective	Course Outcomes				
	a	**b**	**c**	**d**	**e**
I	S				
II	S	S			
III			H		
IV				H	S
V					S

S= Supportive H= Highly Related

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes													
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
a	S													

b	S	S									S			
c	S	S												
d		S					S				S			
e	S		S		S		S				S			

S= Supportive H= Highly Related

QUESTION BANK

S No	QUESTION	Bloom s taxonom y level	Cours e Outcome
	UNIT - I ECOSYSTEMS		
	Part - A (Short Answer Questions)		
1	**Define** ecology and ecosystem.	Remember	1
2	**Differentiate** between food chain and food web.	Understan	1
3	**Define** pyramid of energy.	Remember	1
4	**Briefly** discuss about grassland ecosystem	Analyze	1
5	**Explain** few important characteristics of a forest ecosystem	Understan	1
6	**Define** ecological pyramids.	Understan	1
7	**Define** pyramid of energy.	Remember	1
8	**Differentiate** between grazing food chain detritus food chain.	Analyze	1
9	**Define** photosynthesis process.	Remember	1
10	**Enlist** the types of grasslands in India and two animal species	Remember	1
	Part - B (Long Answer Questions)		
1	**Discuss** the major characteristics features of a river ecosystem different	Remember	1
2	**Enlist** the main components of ecosystem and briefly describe the functions	Remember	1
3	**Explain** the role of producers, consumers and decomposers in an	Understan	1
4	**What** are food chain and food web? Give example and discuss their	Remember	1
5	**What** are biogeochemical cycles? Explain nitrogen cycle with help of a	Understan	1
6	**Describe** five ecosystems goods and services that human	Understan	1
7	**Discuss** the structure and function of desert ecosystem.	Analyze	1
8	**Explain** phosphate and sulphate cycles.	Understan	1
9	**Explain** briefly about indicators of the quality of ecosystem.	Understan	1
10	**What** is meant by biomagnifications? Explain	Understan	1
11	Sustainable management of natural resources is essential to provide	Analyze	1,2
	Part - C (Problem Solving and Critical Thinking Questions)		
1	**Explain** how different development activities, including construction of dams, affect the various ecosystems and what action need	Understan	1
2	**Explain** the impacts of pesticide and other agro chemicals on any	Understan	1

3	**Explain** with examples the links between the activities of man which are	Understan	
4	**Discuss** how are life system affected by stress?	Analyze	1
5	What impacts do human activities have on populations, communities and	Remember	1
6	**Write** a brief scenario describing the sequence of consequences to us other forms of life if decomposers and detritus feeders were some how eliminated, all producers on land in upper zone of aquatic ecosystems were eliminated by drastic increases in UV	Evaluate	1,4,5
7	**Explain** the significance of preserving of balance in various kinds of	Apply	1
8	**Discuss** models of energy flow in an ecosystem	Analyze	1
9	**What** is homeostasis? What are feedback mechanism	Apply	1
10	**Explain** the significance of preserving of balance in various kinds of	Apply	1
UNIT - II NATURAL RESOURCES			
Part – A (Short Answer Questions)			
1	**Enumerate** some of the water resources problems in India.	Analyze	3
2	**Discuss t**he problems of over exploitation of ground water.	Analyze	3
3	**Enlist** different surface and ground water resources.	Remember	4
4	**What** are the environmental effects of using of mineral	Remember	3
5	**What** is mineral? What is its use?	Understan	3
6	**What** is water logging?	Understan	3
7	**What** is soil erosion?	Understan	3
8	**What** are the effects of soil pollution?	Analyze	3
9	**Differentiate** soil texture and structure.	Analyze	3
10	**What** are the different types of natural resources	Remember	3
Part - B (Long Answer Questions)			
1	**What** are Natural resources and write the classification of	Remember	2
2	**Discuss** Big dams - Benefits and problems	Understan	2,3
3	**Wha**t are Mineral Resources, uses and exploitation?	Remember	2,3
4	**What** are alternate energy sources? Explain their present status, merits and	Analyze	2,3
5	**What** are the different types of energies which can be derived from the	Analyze	2,3
6	**Describe** the merits and demerits of nuclear power energy and discuss the	Analyze	2,3
7	**Write** a note on solar energy; also discuss about the solar cells with a diagram and enumerate its applications	Understan	3
8	**Write** a note on growing energy needs?	Remember	3
9	**What** are non renewable energy resources; explain in detail.	Analyze	2,3
10	**What** is an aquifer? Discuss its types?	Understan	2
Part – C (Problem Solving and Critical Thinking)			

1	**Summarize** a detailed report on the management of water and waste water in your town/city?	Remember	2,4
2	Discuss with the help of a case study, how big dams have affected forests	Understan	2
3	**What** mineral resource is extracted in your local area? What mining methods are used.	Remember	2
4	**Evalute** timber harvesting on private and public land s in the local area ?	Understan	2,3
5	**How** is electricity in your community is produced? Does your community	Apply	1,2
6	**Explain** the effects of dams on tribal people with special reference to	Remember	2,3
7	**Discuss** the role played by the non conventional; energy resources towards	Understan	2,3
8	**What** is biogas; discuss the structure and function of the biogas.	Remember	2,3
9	**Write** a note on solar energy; also discuss about the solar cells with a	Understan	2,3
10	Briefly discuss droughts and floods with respect to their occurrence and impacts.	Apply	2,3
UNIT-III BIODIVERSITY			
Part - A (Short Answer Questions)			
1.	**Enumerate** the biogeographical classification of India.	Analyze	4
2.	**What** do you mean by hot spots of biodiversity? Mention the three hot	Remember	4
3.	**Differentiate** between endanger and endemic species.	Differentia	4
4.	**What** is meant by in situ and ex situ conservation of	Understan	4
5.	**What** does NBPGR AND NBAGR stand for? Where are they	Analyze	4
6.	**Enlist** the indirect values of biodiversity	Remember	4
7.	**Define** biological diversity.	Understan	4
8	**Differentiate** genetic and species diversity.	Analyze	4
9.	**Define** national biodiversity act.	Understan	4
10.	**How** do you consider India as a nation of mega diversity nation?	Analyze	4
Part – B (Long Answer Questions)			
1	**Discuss** the causes of man-wild life conflicts. Suggest suitable wild life	Analyze	4
2	**What** is biodiversity? Explain different types of biodiversity.	Understan	4
3	**Explain** in-situ and ex-situ conservation of biodiversity	Understan	4
4	**Briefly** explain endangered species of India?	Remember	4
5	**Identify** and explain the present day major threats to the biodiversity of	Analyze	4
6	**Discuss** the various strategies of conservation of biodiversity?	Analyze	4
7	**Write** the direct and indirect values of biodiversity?	Analyze	4
8	**Explain** the necessity for viewing the biodiversity as a global resource.	Analyze	4
9	**Write** a brief note on conservation of biodiversity?	Understan	4
10	**Write** the direct and indirect values of biodiversity?	Remember	4

Part – C (Problem Solving and Critical Thinking)			
1	**What** are environmental hot spots of your city? Explain the possible factors observed by you for degradation of quality of hot	Understan	4
2	**How** do different developmental activities, including construction of	Evaluate	4
3	**What** are environmental hot spots of your city? Explain the possible factors observed by you for degradation of quality of hot spot. Suggest	Evaluate	4
4	**Identify** examples of habitat destructuction or degradation in your local community that had harmfull effects on the populations of	Evaluate	4
5	**Evaluate** cattle grazing on private and public rangeland and pastures in	Analyze	4
6	**Comment** upon Indian biodiversity with special reference as a megadiversity nation. How do biosphere reserves help in	Apply	4
7	**What** are the different services that are contributed in various ways by biodiversity?	Apply	4
8	**Discuss** the various strategies of conservation of biodiversity?	Understan	4
9	Enumerate five important biosphere reserves, national parks and wild life	Apply	4
10	**Identify** and explain the present day major threats to the biodiversity of	Apply	4
UNIT-IV ENVIRONMENTAL POLLUTION AN CONTROL TECHNOLOGIES			
Part – A (Short Answer Questions)			
1	**Write** about environmental pollution and explain their types.	Understan	5
2	**Define** air pollution and describe the technologies for the control of air	Remember	5,6
3	**Explain** primary and secondary sources of air pollution?	Understan	5
4	**Write** about environmental pollution and explain their types.	Remember	5
5	**What** are the effects of water pollution and enumerate drinking water	Remember	5,6

6	**Briefly** explain the Municipal Solid Waste management	Apply	5,6
7	**Write** a note on climate change and impacts on human	Understan	6
8	**Explain** Ozone depletion and Ozone depleting substances	Evaluate	6
9	**List** out the Sewage treatment plants, effluent treatment plants and	Evaluate,	6
10	**What** are the problems encountered in the disposal of solid waste from	Analyze	5
Part – B (Long Answer Questions)			
1	**List** out the Sewage treatment plants, effluent treatment plants and	Understan	5,6
2	**What** are the problems encountered in the disposal of solid waste from	Apply	5,6
3	**How** e-waste can be effectively managed.	Apply	5,6
4	**List** out the Sewage treatment plants, effluent treatment plants and	Remember	5,6

5	**How** many times during each of past five years have levels of testeted	Creating	5,6
6	**Compare** weather strom drains and sanitary sewers combines or separate in your area? Are there plans to reduce pollution	Evaluate	5,6
7	**Develop** and action plan for reducing your exposure to indoor	Remember	5,6
8	**Identify** at least two moral and ethical responses each to the issue of global	Remember	5,6
9	**Compare** From available air quality data determine weather outdoor air	Evaluate	5,6
10	**Discuss** the salient features of earth summit.	Apply	5,6
Part – C (Problem Solving and Critical Thinking)			
1	**Write** about environmental pollution and explain their types.	Understan	5
2	**Define** air pollution and describe the technologies for the control of air	Remember	5,6
3	**Explain** primary and secondary sources of air pollution?	Understan d	5
4	**Write** about environmental pollution and explain their types.	Remember	5
5	**What** are the effects of water pollution and enumerate drinking water quality standards	Remember	5,6
6	**Briefly** explain the Municipal Solid Waste management	Apply	5,6
7	**Write** a note on climate change and impacts on human	Understan	6
8	**Explain** Ozone depletion and Ozone depleting substances	Evaluate	6
9	**List** out the Sewage treatment plants, effluent treatment plants and	Evaluate	6
10	**What** are the problems encountered in the disposal of solid waste from various sources?	Analyze	5
UNIT-V ENVIRONMENTAL POLICY, LEGISLATION AND EIA			
Part - A (Short Answer Questions)			
1	**Enlist** the objectives of Air pollution act.	Remember	6,7
2	**Explain** the necessity of wild life protection act.	Remember	7
3	**Explain** the necessity of various environmental legislations.	Remember	7
4	**Mention** the objectives of environmental protection act.	Analyze	6,7
5	**What** is environmental impact assessment?	Understan	6
6	**Define** Environmental Imapct Assessment and Environmental Management	Understan	6
7	**Define** sustainable development.	Understan	7
8	**What** is the role of remote sensing and GIS in EIA study.	Understan	6,7
9	**What** is meant by crazy consumerism?	Understan	7
10	**What** are the principles of sustainable cities.	Analyze	7
Part - B (Long Answer Questions)			
1	**Write** about environmental protection Act	Apply	7
2	Disscuss the major provisions in Forest Conservation Act 1980	Evaluate	7
3	**What** are the major municipal solid waste management and	Evaluate	5,6

4	**What** are the biomedical wastes? What are the rules to manage and handle	Evaluate	5
5	**Write** a note on Impacts of air, water, biological and Socio-economical	Apply	4,5
6	**Explain** the concept of sustainable development	Analyze	7
7	**Write** a note on environmental ethics and explain concept of green	Apply	7
8	**Illustrate** Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.	Apply	7
9	**Briefly** explain the Municipal Solid Waste management	Analyze	6,7
10	**Write** a note on climate change and impacts on human	Apply	7
Part – C (Problem Solving and Critical Thinking)			
1	**Identify** environmental education necessary in the present context? What is	Analyze	6,7
2	**Explain** are you crazy about the consumerism?	Remember	7
3	**Describe** Environmental Education and its role in the present	Remember	7
4	**What** is Urban sprawl and how is it related to human health.	Remember	7
6	**Brief** out Ecological Foot Print, Life Cycle assessment (LCA), Low	Remember	7
7	**Disscuss** the role of IT in environment	Apply	7
8	**What** are the earth centric and human centric world views	Evaluate	6,7
9	**Discuss** basic characteristics of Green buildings.	Understan	7
10	**What** is the role assigned to central pollution control board and state	Apply	7

OBJECTIVE QUESTIONS

UNIT-1

FILL IN THE BLANKS

1. The term ecosystem was coined by …… (Tansley)

2. The organisms who feed directly on producers are called ……. (Herbivores)

3. Chemosynthetic organisms can produce organic matter through oxidation of …… In the absence of sunlight. (chemicals)

4. The sequence of eating and being eaten in an ecosystem is called a ……. (Food-chain)

5. Bio magnification of the pesticide ……. In the food chain resulted in the thinning of shells in birds eggs.

6. Pyramid of …… Is always upright. (DDT)

7. Movement of nutrients in an ecosystem is cyclic while flow of energy is ……

(Uni-direction)

8. Guano deposits on the coasts of Peru are rich in the nutrient …… (Phosphorus)

9. The inherent property of all living organisms to resist change is called …… (Homeostasis)

10. Number of individuals that a system can sustain is known as it's …….

(Carrying Capacity)

11. When respiratory loss is added to net primary production it gives ……

(Gross primary production)

12. Edaphic factors relate to …… (Soil)

CHOOSE THE CORRECT ANSWER

1. The organisms which feed on dead organisms, wastes of living organisms are called

(a) Chemotrophs (b) carnivores

(c) Detritivores (d) decomposers

2. The progressive accumulation of some non-biodegradable chemicals through the food chain is known as

(a) Ecological balance **(b) biological magnification**

(**c)** Trophic structure (d) Bio-degradation

3. Gross primary productivity is the highest in

(a) Open oceans (b) grasslands

(c) Wet tropical forests (d) agroecosystem

4. Population tends to get stabilized when the system reaches

(a) Maximum primary production (b) homeostasis

(c) Carrying capacity (d) all the above

5. As energy flows through a food-chain energy in each successive trophic level

(a) Increases **(b) decreases**

(c) Remains unchanged (d) is unpredictable

6. Dead organisms matter accumulating in an eco-system is known as

(a) Detritus (b) standing biomass

(c) Tropic structure (d) soil biomass

UNIT-2

FILL IN THE BLANKS:-

1. ……RESOURSES ARE INEXHAUSIBLE RESOURSES WHICH CAN BE GENERATED IN GIVEN SPAN OF TIME (RENEWABLE)

2. …….RESOURSES CAN NOT BE GENERATED (NON-RENEWABLE)

3. PLANTS ARE …… GAS FOR PHOTOSYNTHESIS (CARBON DIOXIDE)

4. MAXIMUM NUMBER OD DAMS IN INDIA ARE IN THE ……. STATE (MAHARASTRA)

5. …….. DAM IS THE HIGHEST DAM ON RIVER BHAGIRATHI IN UTTARKHAND (THERI)

6. THE …….. DAM ON RIVER SALTUJ IN HP IS THE LARGEST DAM IN TERMS OF CAPACITY (BHAKHRA)

7. ECOLOGICAL ISSUES RELATED WITH THERI DAM WAS TAKEN UP BY SH. …….. THE LEADER OF CHIPOK MOVEMENT (SUNDERLAL BAHUGUNA)

8. ENVIROLMENTAL ACTIVIST MEDHA PATKAR HAS TAHEN UP ISSUES RELATED TO ……. DAM

(SARDAR SAROVAR)

9. ABOUT ……. % OF THE EARTH SURFACE ARE COVERED BY WATER (97%)

10. ONLY …….. % OF TOTAL WATER ON EARTH IS READILY AVALIABLE TO US IN THE FORM OF GROUND WATER AND FRESH WATER (0.6%)

11. A LAYER OF SEDIMENT OR ROCK THAT IS HIGHLY PREMEABLE AND CONTAINS WATER (GROUND-WATER) IS CALLED AN …….. (AQUIFER)

12. AUIFERS WHICH ARE OVERLAID BY PREMEABLE EARTH MATERIAL AND ARE RECHARGED BY SEEPING WATER ARE CALLED …….. AQUIFERS (UN CONFINED)

13. AQUFIRES WHICH ARE SANDWICHED BETWEEN TWO IMPERMEABLE LAYERS OF ROCK OR SEDIMENTS ARE CALLED …….. AQUIFERS (CONFINED)

14. …….. CONDITIONS ARE CREATED WHEN ANNUAL RAINFALL IS BELOW NORMAL AND LESS THAN EVAPORATION (DROUGHT)

15. URANIUM MINING IS DONE IN ……. IN AP (NALGONDA)

16. ……. CAN BE EXTRACTED FROM BAUXITE ORE. (ALUMINIUM)

17. EXCESSIVE USES OF FETILIZERS CAUSE ……. IMBALANCE IN SOIL (NUTRIENT)

18. OCEANS TIDES ARE PRODUCED BY GRAVITATIONAL FORCES OF …… AND …….

(Earth, moon)

19. IN INDIA …… DETAILS ARE THE TIDAL POWER SUTES (SUNDERBAN)

20. FOR OPERATING OCEAN TERMINAL ENERGY COVERSION A DIFFRENCE OF …….. ®C OR MORE IS REQUIRED BETWEEN SURFACE AND DEEPER WATER OF OCEAN. (20®C)

21. …….. CROPS ARE LATEX CONTAINING PLANTS RICH IN HYDROCARBONS (PETRO)

22. BIOGAS IS PRODUCED BY …… DEGRADATION (IN ABSENSE OF OXYGEN) OF BIOLOGICAL WASTES.

(ANIMAL WASTE)

23. GASOHOL IS A MIXTURE OF ……. AND ……. (ETHANOL; GASOLINE)

24. 95% OF NATURE GAS IS ……. (METHANE)

25. NUCELAR ENERGY BY NUCLEAR FUSSION IS GENERATED WHEN CERTAIN ISOTOPES ARE BOMBARDED BY ……. (NEUTRONS)

26. TERRACE FARMING IS PRACTISED AS A SOIL CONVERSION MEASURE IN …… AREAS. (HILLY)

27. INADEQUATE DRAINAGE AND POOR QUANTITY IRRIGATION WATER OFTEN LEAD TO …….. AND …… OF SOILS (SALINITY ; WATER-LOGGING)

CHOOSE THE CORRECT ANSWERS: -

1. PER CAPITA USE OF WATER IS THE HIGHEST IN

(A) USA (B) INDIA

(C)KUWAIT (D) INDONESIA

2. GROUND SUBSIDENCE OCCURS DUE TO

(A) WITHDRAWL OF MORE GROUNDWATER THAN ITS RECHARGE

(B) MORE RECHARGE OF GROUNDWATER THAN ITS WITHDRAWL

(C) EQUAL RATES OF RECHARGE AND WITHDRAWL

(D) NONE OF THE ABOVE

3. NATURAL GEYSERS WHICH OPERATE DUE TO GEOTHERMAL ENERGY ARE PRESENT IN

(A) MANIKARAN IN KALLU (B) SOHANA IN HARYANA

(C) NONE OF THEM **(D) BOTH A & B**

4. BIOMASS ENERGY CAN BE OBTAINED FROM

(A) ENERGY PLANTATIONS

(B) PETRO CROPS

(C) AGRICULTURAL AND URBAN WASTE BIOMASS

(D) ALL THE ABOVE

5. WHICH OF THE TYPE OF COAL HAS MAXIMUM CARBON AND CALORIFIC VALUE?

(A) ANTHRACITE (HARD COAL) (B) BITUMINOUS (SOFT COAL)

(C) LIGNITE (BROWN COAL) (D) WOOD COAL

6. NUCELAR ENERGY CAN BE GENERATED BY

(A) NUCELAR FUSSION (B) NUCELAR FISSION

(C) BOTH A & B (D) NONE OF THESE

7. THE MINIMUM TIME NEEDED FOR THE FORAMATION OF ONE INCH OF TOP OF SOIL IS

(A) 10 YEARS (B) 50 YEARS

(C) 100 YEARS **(D) 200 YEARS**

8. MINIMUM DISTERBANCE IS CAUSED TO SOIL DURING

(A) CONTOUR FARMING **(B) NON-TILL FARMING**

(C) TERACE FARMING (D) ALLEY CROPPING

UNIT-3

FILL IN THE BLANKS

1. WHEN VARITIONS OCCURS WITH ON A SPECIES DUE TO NEW COMBINATION OF GENES, THIS IS CALLED ……. DIVERSITY (GENETIC)

2. SHANNON-WIENER INDEX GIVES A MEASURE OF …… DIVERSITY (SPECIES)

3. DRUGS, FUELWOOD AND FOOD DERIVED FROM BIODIVERSITY REPRESENT ……. VALUE OF BIODIVERSITY (CONSUMPTIVE USE)

4. QUININE IS OBTAINED FROM THE BANK OF …… TREE (CINCHONA)

5. THERE ARE 33 BIODIVERSITY HOT-SPOT IN THE WORLD, OF WHICH ……. EXIST IN INDIA (3)

6. LOSS OF HABITAT IN INSTALMENTS LEADING TO SMALL SCATTERED PATCHES IS KNOWN AS ……. (HABITAT FRAGMENTATION)

7. ILLEGAL KILLING PROHIBITED ENDANGERED ANIMALS IS CALLED ……. (POACHING)

8. RED DATA BOOK GIVING THE LIST OF ENDANGERED SPECIES OF PLANTS AND ANIMALS IS PUBLISHED BY …….. (IUCN)

9. NANDA DEVI, MANAS ARE SUNDERBANS ARE ELAMPLES OF ……. (BIOSPHERE REVERVES)

CHOOSE THE CORRECT ANSWERS

1. WHICH OF THE FOLLOWING IS NOT A HOT-SPOT OF BIODIVERSITY IN INDIA EASTERN ?

(A) EASTERN HIMALAYAS (B) WESTERN GAHTS

(C) SUNDERBANAS (D) INDO-BURMA

2. VINBLASTIN AND VINCRISTINE , TWO ANTICANCER DRUGS HAVE BEEN OBTAINED FROM

(A) PERIWINKLE (B) CINCHONA

(C) BACTERIUM (D) JELLY FISH

3. WESTERN GHATS ARE VERY RICH IN ENDEMIC SPECIES OF

(A) BIRDS (B) LIONS

(C) AMPHIBIANS (D) TURTLES

4. WHICH OF THE FOLLOWING HOT-SPOT OF BIODIVERSITY HAS THE MAXIMUM NUMBER OF PLANTS AND VERTEBRATE SPECIES

(A) CARIBBEAN (B) TROPICAL ANDES

(C) MADAGASCAR (D) INDO-BURMA EASTERN HIMALAYAS

5. WHICH OF THE FOLLOWING IS AN EXTENTIC SPECIES

(A) DUGONG (B) GREAT INDIAN BUSTARD

(C) DODO (D) RED PANDA

6. WHICH OF THE FOLLOWING IS AN EEXAMPLE OF EX-SITU CONVERSION

(A) BIO-SPHERE RESERVE **(B) GENE BANK**

(C) SANCTUARY (D) ALL OF THESE

7. KAZIRANGA NATIONAL PARK IS FAMOUS FOR

(A) ONE-HORNED RHINO (B) HANGUL

(C) TIGER (D) ELEPHANT

8. THERE ARE ONLY TWO SANCTUARIES IN INDIA DEALING WITH PRESERVATION OF PLANTS . THE PLANTS ARE

(A) CINCHONA-ORCHID **(B) CITRUS-PITCHER PLANT**

(C) MANGO-CITRUS (D) MANGO-PITCHER PLANT

9. CRYOPRESERVATION OF PLANT SEEDS AND POLLEN IS DONE AT VERY LOW TEMPARATURE OF -196®C BY USING

(A) ICE (B) CARBON TETRACHLORIDE

(C) LIQUID NITROGEN (D) AMMONIA

10. WHICH OF THE FOLLOWING NATIONAL PARK DO NOT HAVE TIGERS AS THEIR MAIN WILDLIFE

(A) GIR(B) CORBETT

(C) DUDWA (D) RANTHAMBORE

UNIT-4

Fill in the blanks

1. ……. Forms the highest proportion in the vehicular exhaust (CO)

2. Sulphur dioxide during coal burning is produced due to oxidation of …… contained in coal (sulfur)

3. CO has affinity for hemoglobin …… times more than oxygen (210)

4. Air pollution affects plants by entering through …….. (Stomata)

5. Sound frequency is expressed in ……. (Hertz (Hz))

6. Noise levels considered as threshold of pain are …… dB (140)

7. minamata disease occurred due to consumption of fish contaminated with…….. (Methyl mercury)

8. Blue baby syndrome is caused by the presence of …… in drinking water (nitrate)

9. Nitrate concentrations exceeding 25 mg/l in water cause the health hazard called ……..
(Blue baby syndrome)

10. Biological treatment of water waste is called …… treatment. (Secondary)

11. Nutrients nitrate and phosphates cause ……. In water bodies. (Eutrophication)

12. For active fish species, D.O. in water should range from ……. To ……. Mg/l (5 to 8)

13. Electroplating industry effluents contain …….. Metals (heavy)

14. Radioactive strontium deposits in the …… (Bones)

Choose the correct answers

1. Damage of leaf structure by air pollutants causes

(a) Dead areas of leaf (b) chlorophyll reduction

(c) Dropping of leaf **(d) all the above**

2. Air pollutants mixing up with rain can cause

(a) High acidity (b) low acidity

(c) Neutrals conditions (d) none of these

3. Industrial wastes may contain toxic

(a) Chemicals (b) phenols

(c) Acids **(d) all of these**

4. Dissolved oxygen in water comes from

(a) Photosynthesis of aquatic plants (b) atmosphere

(c) None of these **(d) both a & b**

5. Itai Itai disease in japan was caused by consumption of rice contaminated with

(a) Mercury (b) iron

(c) Cadmium (d) zinc

6. Thermal pollution can be controlled by

(a) Cooling ponds (b) spray ponds

(c) Cooling towers **(d) all the above**

7. over irrigation without proper drainage leads to

(a) Water logging (b) salinization

(c) Both a & b (d) none of these

8. Act with prohibits dumping of hazardous waste in ocean is

(a) Clean water act (b) water act

(c) Ocean dumping act (d) clean sea act

9. How much energy provided by fossil fuel for operation of power plants is utilized and rest is lost in the form of heat

(a) 1/6 **(b) 1/3**

(c) 1/10 (d) 1/2

10. Oil in water affects fish by affecting

(a) Gills (b) scales

(c) Eyes **(d) none of these**

11. Which of the following have more penetration power

(a) Alpha particles (b) beta particles

(c) gamma-rays (d) none of these

Fill in the blanks

1. Average global temperature is 15®c. in the absence of greenhouse gasses the temperature would have been …… (-18®c)

2. Ozone layer acts as natural sunscreen which protects life on earth against …….. rays (UV)

3. Ozone concentration is measured in …… units (Dobson)

4. Ozone depleting nature of CFC's was first reported by …….. And …….. (Rowland and Molina)

5. Deforestation means …….. Of forests (degradation)

6. ……. % of geographical area of the country should be forest area (33%)

7. Montreal protocol called for a freeze on the use of …….. (CFC's)

8. Earth summit was held in 1992 at …….. and in 2002 at …… (Rio de Janerio & Johannesburg)

Choose the correct answer

1. Which of the following gasses has maximum contribution to enhanced greenhouse effect

(a) CFC's (b) ch4

(c) co2 (d) n2o

2. cattle, sheep and termites are responsible for the release of the following greenhouse gasses

(a) methane (b) carbon dioxide

(c) nitrous oxide (d) all the above

3. the most important agents for ozone depletion are

(a) methane (b) CFC's

(c) nuclear fallout (d) nitrous oxide

4. maximum depletion of ozone occurs on

(a) equator (b) north pole

(c) south pole (d) tropics

5.Deforestation rate is alarming in

(a) temperate countries (b) fuel requirements

(c) polar region (d) none of these

6. major causes of deforestation are

(a) shifting cultivation (b) fuel requirements

(c) raw material for industries (d) all of these

7. over grazing results in

(a) productive soil (b) soil erosion

(c) retention of useful species (d) all of these

8. UVB radiations which reach earth can cause

(a) skin cancer (b) cataract

(c) suppression in immune system (d) all the above

UNIT-5

Fill in the blanks

1. EIA gazette notification in India was done under environment (protection) Act in the year …….. and amended in…….. (1994; 2006)

2. Whether a project needs an EIA clearance or not is decided during …… (Screening)

3. CRZ stands for…… (Coastal Regulatory Zone)

4. The EIA report based on a single season data (other than mansoon period) is called …… (Rapid EIA)

5. A technique or recharge groundwater by capturing and storing rainwater is known as ……

(Rainwater harvesting)

6. The person from Rajasthan who has been awarded Magsaysay award for his work on rain-water harvesting, who is popularly called “water man” is ……. (Rajendra Singh)

Choose the correct answer

1. Gazette notification on EIA is issued by

(a) ministry of human resource development

(b) Ministry of environment and forest

(c) Ministry of finance

(d) ministry of Urban Development

2. EIH helps to

(a) Achieve sustainable development

(b) Reap environmental benefits without its degradation

(c) Maintain balance between pollution and resources

(d) All the above

3. One example of irreversible impact is

(a) Deforestation of land **(b) loss of an endangered spices**

(c) Change in landscape (d) loss of soil fertility

4. Which of the following sequence in EIA are in correct order

(a) Scoping-prediction-identification-evaluation

(b) screening- Scoping-identification-prediction

(c) Scoping-evaluation-prediction-mitigation

(d)) screening-Scoping-mitigation-evaluation

5. Study of various atmospheric parameters are included in

(a) Geology (b) hydrology

(c) Meteorology (d) ecology

6. Rainwater harvesting helps in

(a) Reduce run-off (b) groundwater recharge

(c) Reduce water pollution **(d) all of these**

<u>Fill in the blanks</u>

1. The first country in the world to make constitutional provisions for environmental protection is …… (India)

2. Noise pollution was included as pollution in the air (prevention and control of pollution) act in the year …….. (1987)

3. Aggrieved industries on being rejected consent by the pollution control board can file an appeal to ……. Authority for redressal (appellate)

4. Environment protection act came into force in the year …….. on birth anniversary of Smt. Indira Gandhi (1986)

5. Packing, Labeling and handling hazardous waste is done strictly following the guidelines issued by …… under the Hazardous material (management, handling and transboundary movement) rules. (central pollution control board)

6. National Environment policy was formulated in the year ……. Based on several other policies. (2006)

Choose the correct answer

1. which article in the constitution recognizes environmental protection as one of the fundamental duties of every citizen of India

(a) Article 42 (b) Article 48A

(c) Article 51 A(g) (d) Article 52

2. As per the forest Act, Cultivation of which of the following is a non-forest activity

(a) Tea (b) Rubber

(c) Mulberry **(d) All the above**

3. Which of the following is not a characteristic of a hazardous substance

(a) Corrosive (b) Explosive

(c) Carcinogenic **(d) Allergic**

4. which of the following rules were farmed under environment(protection) act

(a) environment (protection) rules

(b) bio medical waste management and handling rules

(c) hazardous material (management and handling rules)

(d) all the above

5. Which act is known as "umbrella act"

(a) water (prevention and control of pollution) Act , 1974

(b) air(prevention and control of pollution) Act, 1981

(c) Environmental (protection act) , 1986

(d) Forest conservation Act, 1980

Fill in the blanks

1. The term 'Sustainable Development' was given and defined by …… (G.H.Brundtland)

2. The Earth summit was held at …….. and the UN World Summit on Sustainable Development (WSSD) was held in …… (Rio de Janeiro, Brazil; Johannesburg, South Africa)

3. …….. is the capacity to tolerate different stresses .(Assimilative Capacity)

4. Expanding population is predicted when the age pyramid is…….. shaped and a declining population is predicted when it …… shaped. (Pyramid shaped, Urn shaped)

5. If a nation has 2% annual growth rate , its population will double in …….. years. (35years)

6. Environmental is made available to design makers, researchers and scientists through a government network system called …… (Environmental Information System, ENVIS)

7. For reduction of emissions through CDM projects saleable credits can be earned , which is known as …….. (CER: Certified Emission Reduction)

8. Haphazard growth of urban settlements in outer boundary of cities is known as …… (Urban Sprawl)

9. The 3-R approach of resource use stands for …… ,……. And …… (Reduce, Reuse, Recycle)

Choose the correct answer

1. UN Conference on Environment and Development is popularly known as

(a) Montreal protocol (b) Kyoto protocol

(c) earth Summit (d) Basel Conversion

2. Capacity of a system to a sustain a maximum number of organisms in a long term basis is known as

(a) carrying capacity (b) buffering capacity

(c) regenerating capacity (d) assimilating capacity

3. The present world population has crossed

(a) 4 billion (b) 5 billion

(c) 6 billion (d) 7 billion

4. Stable population trend is predicted when age pyramid is

(a) bell shaped (b) pyramid shaped

(c) urn shaped (d) none of these

5. Every ……. Person in this world is Indian

(a) 5th**(b) 6th**

(c) 7th (d) 8th

6. Which state in India has lowest birth rate

(a) J&K **(b) Kerala**

(c) H.P (d) Bihar

7. Chemicals that cause abnormalities during embryonic growth and development are known as

(a) carcinogenic (b) mutagenic

(c) allergenic**(d) teratogenic**

8. Rating of green building is done by

(a) CPCB **(b) GIRHA**

(c) NEERI (d) MoEF