# K.L.N. COLLEGE OF ENGINEERING

**POTTAPALAYAM - 630 612 (11KM from Madurai City)**

**SIVAGANGAI DISTRICT, TAMILNADU, INDIA**

(Sponsored by K.L.N. Sourashtra College of Engineering Council)

**An ISO 9001:2015 Certified Institution**

## DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Approved by AICTE, New Delhi

Permanently Affiliated to Anna University, Chennai

Accredited by NBA up to 30.06.2019

Research Centre of Anna University

# STUDENTS HAND BOOK

**For B.E. – EEE**

**III – Semester**

**Odd Semester 2017 – 2018**

**K.L.N. COLLEGE OF ENGINEERING**

**Department of Electrical and Electronics Engineering**

**STUDENTS HAND BOOK**

**B.E. – EEE – III – Semester – Odd Semester of 2017 – 2018**

**This book contains the following:**

**K.L.N. COLLEGE OF ENGINEERING**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## VISION AND MISSION OF THE COLLEGE

**VISION:**

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

**MISSION:**

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

## VISION AND MISSION OF THE DEPARTMENT

**VISION:**

To become a high standard of excellence in Education, Training and Research in the field of Electrical & Electronics Engineering and allied applications.

**MISSION:**

To produce excellent, innovative and Nationalistic Engineers with Ethical Values and to advance in the field of Electrical & Electronics Engineering and allied areas.

## HISTORY OF THE DEPARTMENT

<table>
<tr><th colspan="2">B.E. - EEE</th><th colspan="2">M.E. - PSE</th><th colspan="2">Ph.D.</th></tr>
<tr><td rowspan="4">Year of start & History of Intake</td><td>1994, with an intake of 40</td><td rowspan="4">Year of start & History of Intake</td><td>2004, with an intake of 18</td><td>Year of Recognition as Research Centre</td><td>2012</td></tr>
<tr><td>1996, with an intake of 60</td><td rowspan="3">2012, with an intake of 24</td><td rowspan="3">First Renewal</td><td rowspan="3">2015, upto December 2018</td></tr>
<tr><td>2002, with an intake of 90</td></tr>
<tr><td>2011, with an intake of 120</td></tr>
<tr><td colspan="6">Both UG & PG programs are permanently affiliated to Anna University, Chennai.</td></tr>
<tr><th colspan="6">Accreditation status</th></tr>
<tr><th>First Accreditation</th><th>Second Accreditation</th><th>Third Accreditation</th><th colspan="3">Fourth Accreditation</th></tr>
<tr><td>3 YEARS W.E.F. 19-3-2004</td><td>3 YEARS W.E.F. 19-7-2008</td><td>2 YEARS W.E.F. 05-08-2013</td><td colspan="3">Academic Year 2016-17,2017-18 and 2018-19, i.e., upto 30-06-2019</td></tr>
</table>

## FACULTY PROFILE as on July 2017

| Ph.D's | Doing Ph.D | M.E. |
|---|---|---|
| **10** | **8** | **13** |

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Educational Objectives of the Electrical and Electronics Engineering (EEE) Programme represent major accomplishments that we expect our graduates to achieve after three to five years of graduation. More specifically our graduates are expected:

**PEO1:** to excel in industrial or graduate work in Electrical and Electronics Engineering and allied fields

**PEO2:** to practice their Professions conforming to Ethical Values and Environmentally friendly policies

**PEO3:** to work in international and multi-disciplinary Environments

**PEO4:** to successfully adapt to evolving Technologies and stay current with their Professions

## PROGRAM SPECIFIC OUTCOMES (PSOs)

Electrical and Electronics Engineering Graduates will be able to:

**PSO1:**

Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.

**PSO2:**

Apply appropriate techniques and modern Engineering hardware and software tools in power systems to engage in life- long learning and to successfully adapt in multi disciplinary environments.

**PSO3:**

Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.

## PROGRAM OUTCOMES (POs)

Electrical and Electronics Engineering Graduates will be able to:

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** 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, and give and receive clear instructions.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## OUTCOME BASED EDUCATION (OBE)

In a traditional education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age. The goal of traditional education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material.

An outcome is a culminating demonstration of learning; it is what the student should be able to do, at the end of a course/program, in-terms of the knowledge, skill and behavior.

Outcome-based education is an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the course. In outcome-based education, product defines process. Outcome-based education can be summed up as results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process. Outcome-based education promotes fitness for practice and education for capability.

## BENEFITS AND SIGNIFICANCE OF ACCREDITATION

The process of accreditation helps in realizing a number of benefits, such as:

- Helps the Institution to know its strengths, weaknesses and opportunities
- Initiates Institutions into innovative and modern methods of pedagogy
- Gives Institutions a new sense of direction and identity
- Provides society with reliable information on quality of education offered
- Promotes intra and inter-Institutional interactions

Accreditation signifies different things to different stakeholders. These are:

**Benefits to Institutions**

Accreditation is market-driven and has an international focus. It assesses the characteristics of an Institution and its programmes against a set of criteria established by National Board of Accreditation. NBA's key objective is to contribute to the significant improvement of the Institutions involved in the accreditation process. Accreditation process quantifies the strengths, weaknesses in the processes adopted by the Institution and provides directions and opportunities for future growth. NBA provides a quality seal or label that differentiates the Institutions from its peers at the national level. This leads to a widespread recognition and greater appreciation of the brand name of Institutions and motivates the Institutions to strive for more.

**Benefits to Students**

Students studying in NBA accredited Institutions can be assured that they will receive education which is a balance between high academic quality and professional relevance and that the needs of the corporate world are well integrated into programmes, activities and processes. It signifies that he has entered the portals of an Institution, which has the essential and desirable features of quality professional education.

**Benefits to Employers**

Accreditation assures prospective employers that students come from a programme where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well established technical inputs.

**Benefits to the Public**

Accredited status represents the commitment of the programme and the Institution to quality and continuous improvement.

**Catalyst for International Accreditations**

Due to accreditation from NBA, the Institution's systems and procedures get aligned with the Institution's Mission and Vision. All essential prerequisites for international accreditation are included in the accreditation process of NBA. Therefore, NBA acts as a catalyst for the Institutions planning to acquire International Accreditation.

**Benefits to Industry and Infrastructure Providers**

It signifies identification of quality of Institutional capabilities, skills and knowledge.

**Benefits to Parents**

It signifies that their ward goes through a teaching-learning environment as per accepted good practices.

**Benefits to Alumni**

It reassures alumni that alumni are products of an institute with a higher standing in terms of learning.

**Benefits to Country**

Accreditation helps in gaining confidence of stakeholders and in giving a strong message that as a country, our technical manpower is of international standards and can be very useful in enhancing the global mobility for our technical manpower.

## ENGINEERING ETHICS

Engineering Ethics is the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impact lives. When ethics is not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts, but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important.

The National Society of Professional Engineers (NSPE) decides the overall standards and codes of ethics for all the engineering professions. The Preamble of the NSPE *Code of Conduct for Engineers* (2007) states: "*Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property, and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property, or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.*"

### Electrical Engineering Ethics

Electrical Engineering is a type of engineering profession that deals with the creation of better electronics. Since our society is heading towards an era of technology, where all members of society will be affected, it is especially important for electrical engineers to follow a code of engineering ethics. For electrical engineers, an important set of guidelines is the Electrical Engineering Code of Ethics, published by IEEE.

### IEEE code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

**Engineering Ethics in College/Education**

The main engineering ethics problem that college students are face with is academic integrity. Academic integrity can show itself in the form of cheating by copying someone's work, intentional cheating, plagiarism, and/or self-plagiarism.

However, professional ethics is something that can be learned even when it conflicts with personal ethics, as for example, a situation where you are personally okay with building a product that can harm the environment, yet save lives. You can learn professional ethics and realize that something that is harmful to the environment is not okay. Ethics codes can even help you see the bigger picture. For example, in the previous scenario, these codes can help you re-evaluate your ethics and realize that something that is harmful to the environment will eventually be harmful to the people around you and yourself.

**Engineering Ethics in the Professional World**

In the professional world, ethical engineering problems come up in many cases. One of these includes the case of a professional using someone else's work that is published in the widespread market of publication. Another is the case of a professional using someone else's work that is not published yet and stealing their idea. Engineers who have good engineering ethics often have a good sense of the value of life. They don't hesitate to admit that they made a mistake because they know that the cost of not owning up to your mistakes can have disastrous consequences. It might even cost a human life.

**Engineering Ethics in Companies**

Not only do individual engineers have to be conscious of engineering ethics, but also companies. Companies have to be aware of their Corporate Social Responsibility and Environmental Responsibility. Corporate Social Responsibility is a company's responsibility to give back to the community that they profit from and to behave ethically so that both they and their community can benefit. Environmental Responsibility is a business's initiative to leave the environment (where it is taking its resources from) the same, if not better, that it is found it.

# BLOOM'S TAXONOMY

***Definitions of the different levels of thinking skills in Bloom's taxonomy***

1. **Remember** – recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.

2. **Understand** – the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.

3. **Apply** – being able to use previously learned information in different situations or in problem solving.

4. **Analyze** – the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.

5. **Evaluate** – being able to judge the value of information and/or sources of information based on personal values or opinions.

6. **Create** – the ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts an ideas.

**List of Action Words Related to Critical Thinking Skills**

| REMEMBER | UNDERSTAND | APPLY | ANALYZE | EVALUATE | CREATE |
|---|---|---|---|---|---|
| Count | Associate | Add | Analyze | Appraise | Categorize |
| Define | Compute | Apply | Arrange | Assess | Combine |
| Describe | Convert | Calculate | Breakdown | Compare | Compile |
| Draw | Defend | Change | Combine | Conclude | Compose |
| Identify | Discuss | Classify | Design | Contrast | Create |
| Label | Distinguish | Complete | Detect | Criticize | Drive |
| List | Estimate | Compute | Develop | Critique | Design |
| Match | Explain | Demonstrate | Diagram | Determine | Devise |
| Name | Extend | Discover | Differentiate | Grade | Explain |
| Outline | Extrapolate | Divide | Discriminate | Interpret | Generate |
| Point | Generalize | Examine | Illustrate | Judge | Group |
| Quote | Give | Graph | Infer | Justify | Integrate |
| Read | examples | Interpolate | Outline | Measure | Modify |
| Recall | Infer | Manipulate | Point out | Rank | Order |
| Recite | Paraphrase | Modify | Relate | Rate | Organize |
| Recognize | Predict | Operate | Select | Support | Plan |
| Record | Rewrite | Prepare | Separate | Test | Prescribe |
| Repeat | Summarize | Produce | Subdivide | | Propose |
| Reproduce | | Show | Utilize | | Rearrange |
| Select | | Solve | | | Reconstruct |
| State Write | | Subtract | | | Related |
| | | Translate | | | Reorganize |
| | | Use | | | Revise |
| | | | | | Rewrite |
| | | | | | Summarize |
| | | | | | Transform |
| | | | | | Specify |

**K.L.N.COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**

**ACADEMIC CALENDAR - ODD Semester of 2017 - 2018.**

**UG & PG COURSES – III, V, VII SEMESTER – SUMMARY (Revised)**

| S.No | Date | Programme / Events | Day |
|---|---|---|---|
| | | **June 2017** | |
| 1. | 12.06.2017 (Mon) | Student development and training programmes :<br>(12th June- 24th June 2017) - Departments | |
| 2. | 19.06.2017 (Mon) | Faculty Meeting - I | |
| 3. | 21.06.2017(Wed) | Reopening Day - III,V&VII Semester UG classes<br>Class Committee Meeting - I | 01 |
| 4. | 22.06.2017 (Thu) | Student Counsellor Meeting – I | 02 |
| 5. | 26.06.2017 (Mon) | ***Ramzan – Holiday*** | |
| 6. | 29.06.2017 (Thu) | Grievance redressal Committee Meeting | 07 |
| 7. | 30.06.2017(Fri) | IIPC & IDCA review meeting-I | 08 |
| | | **July 2017** | |
| 8. | 03.07.2017 (Mon) | *Commencement of Classes – III & V Semester M.E, MBA & MCA Courses* | 09 |
| 9. | 12.07.2017 (Wed) | Class Test-I- (12th – 19th July 2017) | 17 |
| 10. | 24.07.2017 (Mon) | Anti-Ragging Committee Meeting | 26 |
| 11. | 27.07.2017 (Thu) | Faculty Meeting - II | 29 |
| 12. | 31.07.2017 (Mon) | CIT – I – 31st July – 07th August 2017 | 31 |
| | | **August 2017** | |
| 13. | 01.08.2017(Tue) | *Commencement of Classes-First year B.E./B.Tech.* | 32 |
| 14. | 08.08.2017 (Tue) | *Remedial / Retest Classes* | 37 |
| 15. | 14.08.2017 (Mon) | ***Krishna Jeyanthi – Holiday*** | |
| 16. | 15.08.2017(Tue) | ***Independence Day – Holiday*** | |
| 17. | 18.08.2017 (Fri) | Student Counsellor Meeting – II | 44 |
| 18. | 21.08.2017 (Mon) | Class Test-II- 21st – 28th Aug 2017.<br>Class Committee Meeting - II | 45 |
| 19. | 25.08.2017 (Fri) | ***Vinayagar Chathurthi – Holiday*** | |
| 20. | 26.08.2017 (Sat) | Parents – Teachers Meeting | 49 |
| | | **September 2017** | |
| 21. | 02.09.2017 (Sat) | *Bakrid – Holiday* | |
| 22. | 04.09.2017 (Mon) | **Faculty Meeting - III** | 55 |
| 23. | 11.09.2017 (Mon) | **CIT – II– 11th – 18th Sep 2017.** | 61 |
| 24. | 25.09.2017 (Mon) | **Model Practical Examinations 25th –28th Sep. 2017.** | 72 |
| 25. | 28.09.2017 (Thu) | **NBA – CO attainment – Even Semester of 2016 – 2017 - Finalization** | 75 |
| 26. | 29.09.2017 (Fri) | ***Ayutha Pooja- Holiday*** | |
| 27. | 30.09.2017 (Sat) | ***Vijaya Thasami – Holiday*** | |
| | | **October 2017** | |
| 28. | 01.10.2017 (Sun) | ***Moharam - Holiday*** | |
| 29. | 02.10.2017 (Mon) | ***Gandhi Jeyanthi - Holiday*** | |
| 30. | 03.10.2017 (Tue) | Class Test- III - 3rd -5th Oct 2017<br>Students feedback on faculty, college facility, Course Outcome Survey | 76 |
| 31. | 05.10.2017 (Thu) | Class Committee Meeting - III | 78 |
| 32. | 06.10.2017 (Fri) | Faculty meeting - IV | 79 |
| 33. | 09.10.2017 (Mon) | Anna University Practical Examinations – Tentative – Slot – I-Tentative | 80 |
| 34. | 13.10.2017 (Fri) | Model Theory Examinations (14th – 23rd Oct 2017) | 84 |
| 35. | 18.10.2017 (Wed) | ***Deepavali – Holiday*** | |
| 36. | 19.10.2017 (Thu) | Program Assessment Committee meeting-PO-Assessment-2013-2017 Batch-Planning for DAC meeting | 88 |
| 37. | 21.10.2017 (Sat) | Last Working Day-III,V,VII Semester B.E./B.Tech | - |
| 38. | 30.10.2017(Mon) | ***Commencement of end semester Examinations (III,V & VII semester B.E./B.Tech, III Semester M.E.,M.B.A.,and III,V semester MCA*** | 96 |
| 39. | 06.11.2017(Mon) | Winter vacation-Phase –I- | |

Reopening day for the staff after Winter Vacation: 11.12.2017 (Monday)

Reopening day for the Even semester of 2017 – 2018: 18.12.2017 (Monday).

Academic Performance evaluation of faculty-2017-2018 (Odd Semester) – 11th – 15th Dec 2017.

**K.L.N.COLLEGE OF ENGINEERING, POTTAPALAYAM - 630612.**

**Department of Electrical and Electronics Engineering**

**CLASS WISE TIME TABLE -2017-2018 (ODD)**

**Year/Sem/Sec : II / III / A** **Faculty In-charge :M.Jeyamurugan**

| ***TIME→ DAY↓*** | **09.00 – 09.50** | **09.50 – 10.40** | **10.55- 11.45** | **11.45- 12.35** | | **01.15- 02.05** | **02.05- 02.55** | **02.55- 03.45** | **03.55- 04.45** |
|---|---|---|---|---|---|---|---|---|---|
| ***PERIOD→*** | **I** | **II** | **III** | **IV** | | **V** | **VI** | **VII** | **VIII** |
| ***MON*** | **ESE** JS | **EMT** ASSM | **DLC(T)** RJPP,TG | **ESE** JS | ***L U N C H*** | **TPDE** PB | **EDC** MJM | **EMT** ASSM | - |
| ***TUE*** | **LICA** SR | **EDC(T)** MJM,RJPP | **DLC** RJPP | **TPDE** PB | | **LICA** SR | **E LAB / LDIC LAB** MJM,TG / RJPP, SR | | |
| ***WED*** | **EDC** MJM | **LICA** SR | **TPDE** PB | **EMT(T)** ASSM,AMJ | | **DLC** RJPP | **ESE** JS | **EDC/DLC** MJM/RJPP | **TPO** |
| ***THU*** | **DLC** RJPP | **ESE** JS | **EDC** MJM | **EMT** ASSM | | **TPDE** PB | **E LAB / LDIC LAB** MJM,TG / RJPP, MML | | |
| ***FRI*** | **TPDE** PB | **EMT** ASSM | **DLC** RJPP | **EDC** MJM | | **LICA** SR | **EMT** ASSM | **ESE/LICA** JS/SR | - |

**Year/Sem/Sec : II / III / B** **Faculty In-charge :S.Rajalingam**

| ***TIME→ DAY↓*** | **09.00 – 09.50** | **09.50 – 10.40** | **10.55- 11.45** | **11.45- 12.35** | | **01.15- 02.05** | **02.05- 02.55** | **02.55- 03.45** | **03.55- 04.45** |
|---|---|---|---|---|---|---|---|---|---|
| ***PERIOD→*** | **I** | **II** | **III** | **IV** | | **V** | **VI** | **VII** | **VIII** |
| ***MON*** | **LICA** SR | **EDC** MJM | **LICA** SR | **ESE** MML | ***L U N C H*** | **E LAB / LDIC LAB** TG,JS / SR,MML | | | - |
| ***TUE*** | **TPDE** MR | **DLC** TG | **EMT(T)** AM | **EDC** MJM | | **TPDE** MR | **ESE** MML | **TPO** | **ESE** MML |
| ***WED*** | **ESE** MML | **DLC** TG | **EDC** MJM | **EMT** AM | | **TPDE** MR | **E LAB / LDIC LAB** TG,AMJ / SR,MML | | |
| ***THU*** | **DLC(T)** TG,MJM | **TPDE** MR | **DLC** TG | **EMT** AM | | **EDC(T)** MJM,TG | **LICA** SR | **EMT** AM | **LICA** SR |
| ***FRI*** | **EMT** AM | **EDC** MJM | **LICA/ESE** SR,MML | **TPDE** MR | | **DLC** TG | **EMT** AM | **EDC\DLC** MJM/TG | - |

| **SUB CODE** | **SUBJECT NAME** | | **STAFF NAME** | |
|---|---|---|---|---|
| | | | **Section - A** | **Section - B** |
| MA6351 | Transforms and Partial Differential Equations | TPDE | P. Brindha | M. Ramya |
| EE6301 | Digital Logic Circuits | DLC | R.Jeyapandiprathap | T.Gopu |
| EE6302 | Electromagnetic Theory | EMT | A.S.S.Murugan | A. Marimuthu |
| GE6351 | Environmental Science and Engineering | ESE | Dr.J. Sangeetha | Dr.M. Mahalakshmi |
| EC6202 | Electronic Devices and Circuits | EDC | M.Jeyamurugan | M.Jeyamurugan |
| EE6303 | Linear Integrated Circuits and Applications | LICA | S.Rajalingam | S.Rajalingam |
| EC6361 | Electronics Laboratory | E LAB | M.Jeyamurugan | M.Jeyamurugan |
| EE6311 | Linear and Digital Integrated Circuits Laboratory | LDIC LAB | R.Jeyapandiprathap | S.Rajalingam |

**SEMESTER III**

| **S.NO.** | **COURSE CODE** | **COURSE TITLE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|---|
| 1 | MA6351 | Transforms and Partial Differential Equations | 3 | 1 | 0 | 4 |
| 2 | EE6301 | Digital Logic Circuits | 3 | 1 | 0 | 4 |
| 3 | EE6302 | Electromagnetic Theory | 3 | 1 | 0 | 4 |
| 4 | GE6351 | Environmental Science and Engineering | 3 | 0 | 0 | 3 |
| 5 | EC6202 | Electronic Devices and Circuits | 3 | 1 | 0 | 4 |
| 6 | EE6303 | Linear Integrated Circuits and Applications | 3 | 0 | 0 | 3 |
| 7 | EC6361 | Electronics Laboratory | 0 | 0 | 3 | 2 |
| 8 | EE6311 | Linear and Digital Integrated Circuits Laboratory | 0 | 0 | 3 | 2 |
| | | **TOTAL** | **18** | **4** | **6** | **26** |

**MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C**

**3 1 0 4**

**OBJECTIVES:**

To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.

To acquaint the student with Fourier transform techniques used in wide variety of situations.

To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

**UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

**UNIT II FOURIER SERIES 9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

**UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

**UNIT IV FOURIER TRANSFORMS 9+3**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

**UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 9+3**

Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

**TEXT BOOKS:**


1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.


**REFERENCES:**


1. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5. Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
6. Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi, 2013.

**EE6301** **DIGITAL LOGIC CIRCUITS** **LT P C**
**3 1 0 4**

**OBJECTIVES:**

To study various number systems , simplify the logical expressions using Boolean functions
To study implementation of combinational circuits
To design various synchronous and asynchronous circuits.
To introduce asynchronous sequential circuits and PLCs
To introduce digital simulation for development of application oriented logic circuits.

**UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 9**

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code0- Digital Logic Families ,comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

**UNIT II COMBINATIONAL CIRCUITS 9**

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations-minimization using K maps - simplification and implementation of combinational logic - multiplexers and demultiplexers - code converters, adders, subtractors.

**UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9**

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

**UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES 9**

Asynchronous sequential logic circuits-Transition table, flow table-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmable Logic Devices: PROM – PLA –PAL.

**UNIT V VHDL 9**

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flipflops, FSM, Multiplexers /Demultiplexers).

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

Ability to understand and analyse, linear and digital electronic circuits.

**TEXT BOOKS:**


1. Raj Kamal, ' Digital systems-Principles and Design', Pearson Education 2nd edition, 2007.
2. M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 2012.


**REFERENCES:**


1. Mandal "Digital Electronics Principles & Application, McGraw Hill Edu,2013.
2. William Keitz, Digital Electronics-A Practical Approach with VHDL,Pearson,2013.
3. Floyd and Jain, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
4. Anand Kumar, Fundamentals of Digital Circuits,PHI,2013.
5. Charles H.Roth,Jr,Lizy Lizy Kurian John, 'Digital System Design using VHDL, Cengage, 2013.
6. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.
7. Gaganpreet Kaur, VHDL Basics to Programming, Pearson, 2013.
8. Botros, HDL Programming Fundamental, VHDL& Verilog, Cengage, 2013.

**EE6302 ELECTROMAGNETIC THEORY L T P C**

**3 1 0 4**

**OBJECTIVES:**

To introduce the basic mathematical concepts related to electromagnetic vector fields

To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.

To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations

To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.

**UNIT I ELECTROSTATICS – I 9**

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields –Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

**UNIT II ELECTROSTATICS – II 9**

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization - Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

**UNIT III MAGNETOSTATICS 9**

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

**UNIT IV ELECTRODYNAMIC FIELDS 9**

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

**UNIT V ELECTROMAGNETIC WAVES 9**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction – Standing Wave – Applications.

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

**TEXT BOOKS:**


1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4 th Edition ,Oxford University Press Inc. First India edition, 2009.
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', PHI Learning Private Limited, New Delhi, Second Edition-2009.
3. K.A. Gangadhar, P.M. Ramanthan ' Electromagnetic Field Theory (including Antennaes and wave propagation', 16th Edition, Khanna Publications, 2007**.**


**REFERENCES:**


1. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), Tata McGraw Hill, 2010
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill 8th Revised edition, 2011.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.
4. Bhag Singh Guru and Hüseyin R. Hiziroglu "Electromagnetic field theory Fundamentals", Cambridge University Press; Second Revised Edition, 2009.

**GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C**

**3 0 0 3**

**OBJECTIVES:**

To the study of nature and the facts about environment.

To finding and implementing scientific, technological, economic and political solutions to environmental problems.

To study the interrelationship between living organism and environment.

To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

To study the dynamic processes and understand the features of the earth's interior and surface.

To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12**

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

**UNIT II ENVIRONMENTAL POLLUTION 10**

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of $SO_2$, $NO_X$, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies –

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

**UNIT III NATURAL RESOURCES 10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical

degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides.
Public awareness.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

Public awareness of environmental is at infant stage.

Ignorance and incomplete knowledge has lead to misconceptions

Development and improvement in std. of living has lead to serious environmental disasters

**TEXT BOOKS :**


1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.


**REFERENCES :**


1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005.

**EC6202 ELECTRONIC DEVICES AND CIRCUITS L T P C**
**3 1 0 4**

**OBJECTIVES:**

**The student should be made to:**

Be familiar with the structure of basic electronic devices.
Be exposed to the operation and applications of electronic devices.

**UNIT I PN JUNCTION DEVICES 9**

PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes- Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

**UNIT II TRANSISTORS 9**

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.

**UNIT III AMPLIFIERS 9**

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

**UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9**

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

**UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9**

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

To explain the structure of the basic electronic devices.
To design applications using the basic electronic devices.

**TEXT BOOKS:**


1. David A. Bell ,"Electronic Devices and Circuits", Prentice Hall of India, 2004.
2. Sedra and smith, "Microelectronic Circuits " Oxford University Press, 2004.


**REFERENCES:**


1. Rashid, "Micro Electronic Circuits" Thomson publications, 1999.
2. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, "Electronic Devices and Circuit theory", 2002.
5. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2004.

**EE6303 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS L T P C**

**3 0 0 3**

**OBJECTIVES:**

To study the IC fabrication procedure.

To study characteristics; realize circuits; design for signal analysis using Op-amp ICs. To study the applications of Op-amp.

To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

**UNIT I IC FABRICATION 9**

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

**UNIT II CHARACTERISTICS OF OPAMP 9**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics,, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters ,summer, differentiator and integrator.

**UNIT III APPLICATIONS OF OPAMP 9**

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, , comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

**UNIT IV SPECIAL ICs 9**

Functional block, characteristics & application circuits with 555 Timer Ic-566 voltage controlled oscillator Ic; 565-phase lock loop Ic ,Analog multiplier ICs.

**UNIT V APPLICATION ICs 9**

IC voltage regulators –LM78XX,79XX Fixed voltage regulators - LM317, 723 Variable voltage regulators, switching regulator- SMPS- LM 380 power amplifier- ICL 8038 function generator IC.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Ability to understand and analyse, linear and digital electronic circuits.

**TEXT BOOKS:**


1. David A.Bell, ‘Op-amp & Linear ICs’, Oxford, 2013.
2. D.Roy Choudhary, Sheil B.Jani, ‘Linear Integrated Circuits’, II edition, New Age, 2003.
3. Ramakant A.Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2003 / PHI. 2000.


**REFERENCES:**


1. Fiore,”Opamps & Linear Integrated Circuits Concepts & Applications”,Cengage,2010.
2. Floyd ,Buchla,”Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, ‘Integrated Electronics - Analog and Digital circuits system’,Tata McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, ‘Op-amp and Linear ICs’, PHI Learning, 6th edition,2012.

**EC6361** **ELECTRONICS LABORATORY** **L T P C**

**0 0 3 2**

**OBJECTIVES:**

To enable the students to understand the behavior of semiconductor device based on experimentation

**LIST OF EXPERIMENTS:**

1. Characteristics of Semi conductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter , common collector and common base configurations
3. Characteristics of JFET(Draw the equivalent circuit)
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
7. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
8. Design and testing of RC phase shift, LC oscillators
9. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
10. Differential amplifiers using FET
11. Study of CRO for frequency and phase measurements
12. Astable and Monostable multivibrators
13. Realization of passive filters

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Ability to understand and analyse, linear and digital electronic circuits.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

1.Semiconducter devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, ± 15V 10
6. CRO 10
7. Storage Oscilloscope 1
8. Bread boards 10
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

**EE6311 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY L T P C**
**0 0 3 2**

**OBJECTIVES:**

Working Practice in simulators / CAD Tools / Experiment test bench to learn design, testing and characterizing of circuit behaviour with digital and analog ICs.

**LIST OF EXPERIMENTS:**

1. Implementation of Boolean Functions, Adder/ Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3. Parity generator and parity checking
4. Encoders and Decoders
5. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
7. Study of multiplexer and demultiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Study of VCO and PLL ICs:
    i. Voltage to frequency characteristics of NE/ SE 566 IC.
    ii. Frequency multiplication using NE/SE 565 PLL IC.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Ability to understand and analyse, linear and digital electronic circuits.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**(3 per Batch)**

| S.No | Name of the equipments / Components | Quantity Required | Remarks |
|---|---|---|---|
| 1 | Dual ,(0-30V) variable Power Supply | 10 | - |
| 2 | CRO | 9 | 30MHz |
| 3 | Digital Multimeter | 10 | Digital |
| 4 | Function Generator | 8 | 1 MHz |
| 5 | IC Tester (Analog) | 2 | |
| 6 | Bread board | 10 | |
| 7 | Computer (PSPICE installed) | 1 | |

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**
**Lecture Schedule [Mon:5;Tue:4;Wed:3;Thu:5;Fri:1]**

**Course/Branch: B.E/ EEE** **Subject Name: Transforms & PDE**
**Duration : June-17 to Oct-17** **Subject Code: MA6351**
**Semester : III Section: 'A&B'** **Staff handling: P.Brindha, M.Ramya /AP2**
**Regulation : 2013 / AUC**

**AIM : To impart basic Mathematical knowledge required for the better understanding of all engineering subjects of various branches.**

**OBJECTIVE: The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.**

**Course Outcomes**
**Students are able to**

| Unit | Course Outcomes | POs | PSOs |
|---|---|---|---|
| CO1 | Solve First, Second order homogeneous and non homogeneous partial differential equations | 1,2,4 | 1,2 |
| CO2 | Find the Fourier series of a given function satisfying Dirchlet's condition. | 1,2,4 | 1,2 |
| CO3 | Apply Fourier series to solve one dimensional way, one and two dimensional heat equations. | 1,2,4 | 1,2 |
| CO4 | Determine Fourier transform for a given function and use them to evaluate certain definite Integrals | 1,2,4 | 1,2 |
| CO5 | Determine z transforms of standard functions and use them to solve difference equations | 1,2,4 | 1,2 |

| S.No. | Date | Period | Topics to be covered | Book No (Page No) |
|---|---|---|---|---|
| **Unit-I : PARTIAL DIFFERENTIAL EQUATIONS** | | | | **Target Hours: 12(as per AUC) Scheduled hours :15** |
| 1 | | | Formation of PDE'S | T1: 1.1 – 1.19<br>T2: 534 - 536 |
| 2 | | | Eliminating arbitrary constants and functions | T1: 1.1 – 1.19<br>T2: 534 - 536 |
| 3 | | | Solutions of standard types ofI Order Equations of the form F(p,q)=0 | T1: 1.23 – 1.29<br>T2: 540 - 543 |
| 4 | | | Clairaut's Form | T1: 1.24 – 1.30<br>T2:543& 414-415 |
| 5 | | | Tutorial-I | |
| 6 | | | Equations of the form F(z,p,q)=0<br>Equations of the form F(x,p)=F(y,q) | T1: 1.24 – 1.37<br>T2: 541 - 542 |
| 7 | | | Problem solving session on S.No 06 | T1: 1.26 – 1.48<br>T2: 540 - 543 |
| 8 | | | Langrange's Linear Equations - Method of grouping | T1: 1.51 – 1.68<br>T2: 538 - 540 |
| 9 | | | Langrange's Linear Equations - Method of Multipliers | T1: 1.51 - 1.68<br>T2: 538 - 540 |
| 10 | | | Tutorial-II | |
| 11 | | | Linear PDE of Second & Higher Order with constant coefficients | T1: 1.71 – 1.75<br>T2: 546 - 551 |
| 12 | | | Problem solving session on S.No 11. | T1: 1.71 – 1.75<br>T2: 546 - 551 |
| 13 | | | Non Homogeneous of second and higher order with constant coefficients. | T2: 551 - 575 |
| 14 | | | Tutorial-III | |
| 15 | | (NPTEL) | Video Session about Applications of Partial Differential Equation in various branches of Engineering. | |
| CT I (12.07.17 TO 19.07.17) | | | | |

| | | | | |
|---|---|---|---|---|
| Assignment:1 Date of announcement: 07.07.17 | | | Date of Submission:10.07.17 | |
| **Unit: II – FOURIER SERIES** | | | **Target Hours: 12(as per AUC) Scheduled hours :15** | |
| 16 | | | Continuity, discontinuity ,limits, periodic functions &Dirichlet's condition | T1: 2.1 - 2.2<br>T2: 368 & 372 |
| 17 | | | Fourier series of periodicity $2\pi$ | T1: 2.5 - 2.39<br>T2: 370 – 372 |
| 18 | | | Fourier Series of periodicity 2l | T1: 2.5 - 2.39<br>T2: 375 – 376 |
| 19 | | | Tutorial-I | |
| 20 | | | Fourier Series of Odd & Even functions | T1: 2.8 – 2.39<br>T2: 377 – 381 |
| 21 | | | Problem solving session on S.No 20. | T1: 2.8 – 2.39<br>T2: 377 – 381 |
| 22 | | | Half Range Sine Series | T1: 2.42 – 2.70<br>T2: 382 – 384 |
| 23 | | | Half Range Cosine Series | T1: 2.42 – 2.70<br>T2: 382 – 384 |
| 24 | | | Problem solving session on S.Nos 21 & 22. | |
| 25 | | | Tutorial-II | |
| 26 | | | Complex form of Fourier series | T1: 2.75 – 2.89<br>T2: 388 – 389 |
| 27 | | | RMS Value, Parseval's Identity | T1: 2.45 – 2.70<br>T2: 386 – 387 |
| 28 | | | Harmonic Analysis | T1: 2.73 – 2.86<br>T2: 389 – 392 |
| 29 | | | Problem solving session on S.No 28 | |
| 30 | | | Tutorial-III | |
| Assignment: IIDate of announcement:24.07.17 | | | Date of Submission:31.07.17 | |
| CIT-I (31.07.17 TO 07.08.17) | | | | |
| **Unit-III :APPLICATIONS OF PDE** | | | **Target Hours: 12(as per AUC) Scheduled hours :15** | |
| 31 | | | Classification of PDE – Methods of separation of variable | T1: 3.2 - 3.38<br>T2: 557- 563 |
| 32 | | | Solutions of one dimensional wave equations With initial velocity is zero | T1: 3.2 – 3.38<br>T2: 557- 563 |
| 33 | | | Solutions of one dimensional wave equations with initial displacement is zero | T1: 4.1 – 4.23<br>T2: 564 – 571 |
| 34 | | | Solutions of one dimensional Heat equation | T1: 4.1 – 4.23<br>T2: 564 - 571 |
| 35 | | | Tutorial-I | |
| 36 | | | Steady state condition with Zero boundary condition in ODHE | T1: 4.5 – 4.26<br>T2: 572 – 575 |
| 37 | | | Steady state condition with Non-zero boundary condition in ODHE | T1: 4.27 – 4.40<br>T2: 572 – 575 |
| 38 | | | Introduction to two dimensional Heat flow equations | T1: 5.18 – 5.47<br>T2: 572 - 573 |
| 39 | | | Solutions of two dimensional Heat flow equations | T1:5.18 – 5.47<br>T2: 572 - 573 |
| 40 | | | Problem solving session on S.Nos 39 | T1:5.18 – 5.47<br>T2: 572 - 573 |
| 41 | | | Tutorial-II | |
| 42 | | | Infinite Plates | T1: 5.6 – 5.18<br>T2: 574 - 575 |
| 43 | | | Problem solving session on S.Nos.4 2 | T1: 5.6 – 5.18<br>T2: 574 - 575 |
| 44 | | | Tutorial-III | |
| 45 | | | Content beyond the syllabus- Solution of Telegraph equation | |
| CT II ( 21.08.17 TO 28.08.17) | | | | |
| Assignment: III Date of announcement: 16.08.17 | | | Date of Submission:25.08.17 | |

| | | | | |
|---|---|---|---|---|
| **Unit-IV : FOURIER TRANSFORMS** | | | | **Target Hours: 12(as per AUC)**<br>**Scheduled hours :15** |
| 46 | | | Fourier Integral Theorem - Problems | T1: 6.1 – 6.6<br>T2: 709 – 712 |
| 47 | | | Fourier Sine Transforms&Properties - Problems | T1: 6.5 – 6.22 &<br>6.26 – 6.31<br>T2: 711 - 717 |
| 48 | | | Fourier Cosine Transforms & Properties - Problems | T1: 6.5 – 6.22 &<br>6.26 – 6.31<br>T2: 711 - 717 |
| 49 | | | Tutorial-I | |
| 50 | | | Complex Fourier Transforms<br>and its Inversion Formula | T1: 6.6 – 6.7<br>T2: 721 - 723 |
| 51 | | | Problem solving session on S.Nos 50. | T1: 6.6 – 6.7<br>T2: 721 - 723 |
| 52 | | | Convolution Theorem and problems | T1: 6.31 – 6.39<br>T2: 718 - 720 |
| 53 | | | Problem solving session on S.Nos 52. | T1: 6.31 - 6.39<br>T2: 718 - 720 |
| 54 | | | Tutorial-II | |
| 55 | | | Parseval's Identity- Introduction | T1: 6.32 - 6.39<br>T2: 719 - 720 |
| 56 | | | Application of Parseval's Identity | T1: 6.32 - 6.39<br>T2: 719 - 720 |
| 57 | | | Problem solving session on S.Nos 56. | |
| 58 | | | Tutorial-III | |
| 59 | | | Content beyond the syllabus – Application of Fourier Transform in DSP | |
| 60 | | | Question Bank Discussion | |
| Assignment:IV Date of announcement: 06.09.17 Date of Submission:12.09.17 | | | | |
| CIT-II(11.09.17 TO 18.09.17) | | | | |
| **Unit-V : Z-TRANSFORM & DIFFERENCE EQUATIONS** | | | | **Target Hours: 12(as per AUC)**<br>**Scheduled hours :15** |
| 61 | | | Definition of Z –Transforms and Properties | T1: 7.1 – 7.5<br>T2: 929 - 931 |
| 62 | | | Elementary functions of Z- Transforms | T1: 7.7<br>T2: 934 |
| 63 | | | Problem Solving Session on S.No 62 | T1: 7.4 – 7.5T2: 936 - 937 |
| 64 | | | Inverse Z- Transforms | T1: 7.29 – 7.32<br>T2: 941 - 943 |
| 65 | | | Tutorial-I | |
| 66 | | | Method of Partial fractions | T1: 7.26 – 7.29<br>T2: 940 - 943 |
| 67 | | | Method of Residues | T1: 7.32 – 7.34<br>T2: 942 - 943 |
| 68 | | | Tutorial-II | |
| 69 | | | Formation of Difference Equations | T1: 7.34 – 7.38<br>T2: 943 - 946 |
| 70 | | | Solution of Difference Equations using Z – tramsforms. | T1: 7.34 – 7.38<br>T2: 943 – 946 |
| 71 | | | Convolution Theorems and Problems | T1: 7.5 – 7.6T2: 939 |
| 72 | | | Tutorial-III | |
| 73 | | | Anna university questions revision - Units III & IV | |
| 74 | | | Anna university questions revision –I & II | |
| 75 | | | Revision- Unit V | |
| CT-III(03.10.17 TO 05.10.17) | | | | |
| Model Exam $14^{th}$,$16^{th}$,$20^{th}$,$23^{rd}$,$24^{th}$,$25^{th}$ October 2017 | | | | |
| Assignment:VDate of announcement: 23.09.17 Date of Submission:28.09.17 | | | | |

**Text Books:**

| S.NO | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|
| 1. | Transforms and Partial Differential Equations | T.Veerarajan (T1) | Tata MC-Graw Hill | 2009 |
| 2. | Higher Engineering Mathematics | Grewal, B.S (T2) | Khanna publishers | 2007 |

**Reference Books**

| SI.No | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|
| 1. | Higher Engineering Mathematics | Ramana.B.V | Tata MC Graw-Hill | 2007 |
| 2. | Advanced Modern Engineering Mathematics | Glyn James | Pearson Education | 2007 |
| 3. | Engineering Mathematics Volume III | Kandasamy.P, Thilagavathy.K and Gunavathy.K | S.Chand& Company Ltd. | 1996 |

| Course Outcomes (CO) | Program Outcome (POs) | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO 5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
| C201.1 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| C201.2 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| C201.3 | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C201.4 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| C201.5 | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C201 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |

| **Content Beyond Syllabus Added(CBS)** | **POs** | **Unit** |
|---|---|---|
| **Content beyond the syllabus- Solution of Telegraph equation** | **PO4** | III |
| **Content beyond the syllabus – Application of Fourier Transform in DSP** http://www.bing.com/videos/search?q=nptel+videos+on+partial+differential+equations&FORM=VIRE1#view=detail&mid=B30416CD5308DB58E2B4B30416CD5308DB58E2B4 | **PO5** | IV |

**STAFF- IN CHARGE**
**(P.BRINDHA)**

**HOD/MATHEMATICS**
**(DR.J.K.SUBASHINI)**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**
**Department of Electrical and Electronics Engineering**
**Lecture Schedule**

Degree/Programme : **B.E / EEE**
Course code & Name: **EE6301 & Digital Logic Circuits** Duration: **July-Oct 2017.**
Semester: **III** Section: **A &B** Staff: **T.Gopu, R. Jeyapandiprathap**
Regulation: **2013/AUC**

**AIM**

- To understand and analyse the digital electronic circuits.

**OBJECTIVES**

- To study various number systems , simplify the logical expressions using Boolean functions
- To study implementation of combinational circuits
- To design various synchronous and asynchronous circuits.
- To introduce asynchronous sequential circuits and PLCs
- To introduce digital simulation for development of application oriented logic circuits.

**Prerequisites:** Computer Programming

**COURSE OUTCOMES:** After the course, the student should be able to

| CO | Course Outcomes | POs | PSOs |
|---|---|---|---|
| C202.1 | List the various types of number system and compare the digital logic families. | 1,2,3,4 | 1 |
| C202.2 | Apply K –Map for simplification and implementation of combinational logic circuit | 1,2,3,4 | 1 |
| C202.3 | Explain the synchronous Sequential logic circuits, draw the block diagram of Shift Registers | 1,2,3,4 | 1 |
| C202.4 | Design of asynchronous sequential circuits and describe the operation of Programmable Logic Devices | 1,2,3,4 | 1 |
| C202.5 | Develop the VHDL coding for combinational logic and Sequential circuits | 1,2,3,4 | 1 |

| S. No | Date | Period Number | Topics to be Covered | Book No [Page No] | |
|---|---|---|---|---|---|
| **UNIT-I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES** | | | | **Target Period : 9+3=12** | |
| | | | Review of number systems: **Decimal, Binary, Octal, Hexadecimal Number System.** | T1[11] | - |
| | | | **Tutorial-1** | - | - |
| | | | Binary codes: **ASCII**, Error detection codes: **Parity Checking of Error Detection** | R4[62,75] | - |
| | | | Error correction codes (Parity and Hamming code) | R4[79] | - |
| | | | **Tutorial-2** | - | - |
| | | | Digital Logic Families: RTL-operation | T1[131] | R9[7.2] |
| | | | DTL, ECL -operation | T1[134] | R9[7.28] |
| | | | TTL -operation | T1[136] | R9[7.6] |
| | | | MOS families -operation | T1[147] | R9[7.19] |
| | | | Comparison of RTL, DTL, TTL, ECL and MOS families, characteristics of digital logic family, Revision. | T1[151] | R9[7.31] R9[7.2] |
| | | | **Tutorial-3** | - | - |
| | | | Seminar-I | - | - |
| **Total Periods:** | | | ***Assignment - I*** | *Date of Submission :**07.7.17*** | |
| | | | ***Test – I: Class Test-I** (12.7.17 – 19.7.17)* | ***Portion :** Unit – 1* | |
| **UNIT – II : COMBINATIONAL CIRCUITS** | | | | **Target Periods : 9+3=12** | |
| | | | Combinational logic circuits: **AND,OR,NOT,NAND,NOR,EX-OR** | T1[53] | R9[1.2] |
| | | | Representation of logic functions | T1[57] | R9[1.4] |
| | | | SOP and POS forms | T1[60,64] | R9[1.8] |
| | | | **Tutorial-4** | - | - |
| | | | K-map representations | T1[76] | R9[1.18] |
| | | | Minimization using K maps | T1[78] | R9[1.56] |

| | | | | | |
|---|---|---|---|---|---|
| | | | Simplification and implementation of combinational logic | T1[89] | R9[1.69] |
| | | | **Tutorial-5** | - | - |
| | | | Multiplexers and demultiplexers | T1[227] | R9[2.40] |
| | | | Code converters-BCD,Gray,Binary,Ex-3code | T1[249] | R9[2.19] |
| | | | Adders, subtractors. | T1[214] | R9[2.5] |
| | | | **Tutorial-6** , Revision | - | - |
| **Total Periods:** | | | ***Assignment - II*** | *Date of Submission :**20.7.17*** | |
| | | | ***Test – II: CIT-I** (31.7.17 – 07.8.17)* | ***Portion :** Unit – 1,II* | |
| **UNIT – III : SYNCHRONOUS SEQUENTIAL CIRCUITS** | | | | **Target Periods : 9+3=12** | |
| | | | Sequential logic- SR, JK flip flops | T1[312] | R9[3.2] |
| | | | D and T flip flops - | T1[326] | R9[3.9] |
| | | | Level triggering and edge triggering of flip flops | T1[335] | R9[3.3] |
| | | | **Tutorial-7** | - | - |
| | | | Counters - asynchronous type | T1[390] | R9[4.59] |
| | | | Counters - synchronous type | T1[400] | R9[4.44] |
| | | | Modulo counters –MOD Counter | T1[395] | R9[4.62] |
| | | | Shift registers –SISO,SIPO,PISO,PIPO | T1[385] | - |
| | | | **Tutorial-8** | - | - |
| | | | Design of synchronous sequential circuits – Moore and Melay models | T1[353] | R9[4.2] |
| | | | Counters, state diagram; state reduction; state assignment. | T1[355] | R9[4.5] |
| | | | **Tutorial-9**, Revision | - | - |
| **Total Periods:** | | | ***Test – III [22.08.17]: Class Test-II** (21.08.17 – 28.08.17)* | ***Portion :** Unit – III* | |
| **UNIT – IV : Asynchronous Sequential Circuits and Programmable Logic Devices** | | | | **Target Periods : 9+3=12** | |
| | | | Asynchronous sequential logic circuits | T1[442] | R9[5.2] |
| | | | Transition table, flow table | T1[459] | R9[5.24] |
| | | | Race conditions | T1[456] | R9[5.30] |
| | | | **Tutorial-10** | - | - |
| | | | Hazards in digital circuits | T1[467] | R9[B.2] |
| | | | Errors in digital circuits | T1[467] | - |
| | | | **Tutorial-11** | - | - |
| | | | Analysis of asynchronous sequential logic circuits | T1[448] | R9[5.4] |
| | | | **Tutorial-12** | - | - |
| | | | Introduction to Programmable Logic Devices: PROM | R4[582] | R9[6.5] |
| | | | PLA | R4[608] | R9[6.19] |
| | | | PAL, Revision | T1[509] | R9[6.33] |
| | | | Quiz-I | - | - |
| **Total Periods:** | | | ***Assignment - III*** | *Date of Submission :**23.8.17*** | |
| | | | ***Test – IV: CIT-II** (11.9.17 – 18.9.17)* | ***Portion :** Unit – III, IV* | |
| **UNIT – V : VHDL** | | | | **Target Periods : 9+3=12** | |
| | | | RTL Design | R5[44] | R9[8.106] |
| | | | Combinational logic circuit-Gates&Adders,Counters | R5[17] | R9[8.94] |
| | | | Sequential circuit-FlipFlops,FSM,MUX&DEMUX | R5[47] | R9[8.77] |
| | | | Operators & Types of Operators | R5[76] | R9[8.16] |
| | | | Introduction to Packages | R5[76] | R9[8.3] |
| | | | Subprograms | - | R9[8.69] |
| | | | Test bench, Revision | - | R9[8.115] |
| | | | Simulation /Tutorial Examples: adders-**13** | - | R9[8.98] |
| | | | Simulation /Tutorial Examples: counters-**14** | - | R9[8.86] |
| | | | Simulation /Tutorial Examples: flip-flops-**15** | R5[44] | R9[8.106] |
| | | | Simulation /Tutorial Examples: FSM | - | R9[8.94] |
| | | | Simulation /Tutorial Examples:Multiplexers/Demultiplexers | R5[54] | - |
| | | | *Quiz-II* | - | - |
| | | | *Seminar-II* | - | - |
| | | | **NPTEL Video & Self Study Topics** | | |
| | | | *Content Beyond Syllabus: Verilog code language for VLSI software based", designed specifically for use in digital electronics and logic circuits drive simulations* | | |
| **Total Periods:** | | | | | |

| S.No | | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|---|
| 1 | T1 | Digital Systems – Principles and Design | Raj Kamal | Pearson Edison, 2nd edition | 2007 |
| 2 | T2 | Digital Design with an introduction to the VHDL | M. Morris Mano | Pearson Education | 2013 |
| 3 | T3 | Digital Logic & State Machine Design, | Comer | Oxford | 2012 |
| 4 | R1 | Digital Electronics Principles & Application | Mandal | McGraw Hill Edu | 2013 |
| 5 | R2 | Digital Electronics-A Practical Approach with VHDL | William Keitz | Pearson | 2013 |
| 6 | R3 | Digital Fundamentals | Floyd and Jain | 8th edition, Pearson Education | 2003 |
| 7 | R4 | Fundamentals of Digital Circuits | Anand Kumar | PHI | 2013 |
| 8 | R5 | Digital System Design using VHDL | Charles H.Roth,Jr,Lizy Lizy Kurian John | Cengage | 2013 |
| 9 | R6 | Digital Logic, Application & Design | John M.Yarbrough | Thomson | 2002 |
| 10 | R7 | VHDL Basics to Programming | Gaganpreet Kaur | Pearson | 2013 |
| 11 | R8 | HDL Programming Fundamental, VHDL& Verilog | Botros | Cengage | 2013 |
| *12* | *R9* | *Digital Logic Circuits* | *A.P.Godse & D.A.Godse* | *Technical Publications* | *2015* |
| *13* | *R10* | *Digital Circuits and Design* | *S.Salivahanan & S. Arivazhzgan* | *Vikas Publication 3rd Edition* | *2008* |

**Books: Text (T) / Reference(R):**

| Unit | http://nptel.ac.in/courses/webcourse-contents/ digital electronics/ | |
|---|---|---|
| I | **http://nptel.ac.in/courses/117103064/** NPTEL >> Electronics & Communication Engineering >> Digital Circuits (Web) >> Digital and Analog Signals | IIT Madras |
| II | **http://nptel.ac.in/courses/117106086/** NPTEL >> Electronics & Communication Engineering >> Digital Circuits and Systems (Video) >> Introduction To Digital Circuits | IIT Guwahati |
| III IV | **http://nptel.ac.in/courses/117105080/** NPTEL >> Electronics & Communication Engineering >> Digital Systems Design (Video) >> Introduction to Digital Systems Design | IIT Kharagpur |
| V | **http://nptel.ac.in/courses/117108040/** NPTEL >> Electronics & Communication Engineering >> Digital System design with PLDs and FPGAs (Video) >> Course Contents, Objective | IISc Bangalore |

**NPTEL:**

**Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – Before CBS**

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C202.1 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |
| C202.2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C202.3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C202.4 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |
| C202.5 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| C202 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |

| Content Beyond Syllabus Added(CBS) | POs strengthened / vacant filled | CO / Unit |
|---|---|---|
| "Verilog code language for VLSI software based", designed specifically for use in digital electronics and logic circuits drive simulations. | PO5(2) strengthened | C202.5/V |

**Staff In charge** **HOD/EEE**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM**

**LECTURE SCHEDULE**

| | | | | | |
|---|---|---|---|---|---|
| Degree/ Program | : | **B.E/ Electrical and Electronics Engineering** | Course code & Name | : | **EE6302- Electromagnetic Theory (C203)** |
| Duration | : | **June 2017 to Nov 2017** | Semester | : | **III** Section : **A & B** |
| Regulation | : | **2013** | Staff handling | : | **A.Marimuthu, Dr A.S.S.Murugan** |

**AIM :** To expose the students to the fundamentals of electromagnetic fields and their applications to Electrical Engineering.

**OBJECTIVES**

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Poynting vector.

**Prerequisites:** Mathematics, Physics

**COURSE OUTCOMES:** After the course, the student should be able to:

| Course | Course Outcome | POs | PSOs |
|---|---|---|---|
| C203.1 | Explain the different coordinate systems, and apply Gauss's law | **1,** | **1** |
| C203.2 | Interpret the concepts of Electrostatic fields and apply boundary conditions on Electrostatic field | **2,** | **1** |
| C203.3 | Develop concepts of Magnetostatic fields and apply boundary conditions. | **3,** **4** | **1** |
| C203.4 | Analyze the Maxwell's equations for electromagnetic fields | | **1** |
| C203.5 | Derive Electromagnetic wave equation and apply the Poynting expression. | | **1** |

| S.No | Date | Period | Topics to be Covered | Book No [Page No] |
|---|---|---|---|---|
| **UNIT I ELECTROSTATICS – I** | | | | **(Target Periods :9+3)** |
| 1. | | | Sources and effects of electromagnetic fields | T1[3-19] |
| 2. | | | Co-ordinate systems | T1[29-46] |
| 3. | | | Vector fields , Gradient, Divergence and Curl, Theorem's and applications | T1[65-90] |
| 4. | | | Coulomb's Law, Electric field intensity | T1[106-111] |
| 5. | | | Field due to discrete and continuous charges | T1[113-124] |
| 6. | | | Gauss's law and application | T1[124-134] |
| 7. | | | Tutorial | |
| | | | | **Total Planned Periods: 12** |
| | | | ***Assignment –I-DOS:*** ***Test-I*** | |
| **UNIT II ELECTROSTATICS – II** | | | | **(Target Periods :9+3)** |
| 8. | | | Electrical potential | T1[135-144] |

| | | | | |
|---|---|---|---|---|
| 9. | | | Electric field and equipotential plots, | T1[688-690] |
| 10. | | | Uniform and Non-Uniform field, Utilization factor, Electric field in free space, conductors | T1[170-175] |
| 11. | | | Electric field in Dielectric – dielectric polarization, Dielectric strength - Electric field in multiple dielectrics | T1[179-182] |
| 12. | | | Boundary conditions, Poisson's and Laplace's equations | T1[190-198] T1[209-210] |
| 13. | | | Capacitance, Energy density | T1[148-152] T1[233- 246] |
| 14. | | | Tutorial | |
| | | | ***Assignment –II-DOS:*** ***CIT-I-*** | |
| | | | | **Total Planned Periods: 12** |
| **UNIT III - MAGNETOSTATICS** | | | | **(Target Periods :9+3)** |
| 15. | | | Magnetic field intensity (H)- Biot-savart's Law | T1[274- 276] |
| 16. | | | H due to straight conductors and circular loop | T1[277- 282] |
| 17. | | | Ampere's Circuit Law , H due to infinite sheet of current | T1[285- 288] |
| 18. | | | Magnetic flux density (B),B in free space, conductor | T1[293- 294] |
| 19. | | | Scalar and vector potential, Lorentz force | T1[296- 298] T1[319-322] |
| 20. | | | Magnetic materials, Magnetization, Magnetic field in multiple media | T1[331- 344] |
| 21. | | | Boundary conditions, Inductance | T1[344- 353] |
| 22. | | | Energy density | T1[353- 361] |
| 23. | | | Magnetic force, Torque, | T1[381- 382] |
| 24. | | | Tutorial | |
| | | | ***Assignment –III-DOS:*** ***Test-3*** | |
| | | | | **Total Planned Periods: 12** |
| **UNIT IV - ELECTRODYNAMIC FIELDS** | | | | **(Target Periods:9+3)** |
| 25. | | | Magnetic circuits | T1[361- 368] |
| 26. | | | Faraday's laws | T1[386- 387] |
| 27. | | | Transformer and motional EMF | T1[388- 391] |
| 28. | | | Displacement current | T1[397- 399] |
| 29. | | | Maxwell's equations (differential and integral forms) | T1[400- 402] |
| 30. | | | Relation between field theory and circuit theory, Applications | Material |
| 31. | | | Tutorial | |
| | | | | **Total Planned Periods: 12** |
| | | | ***CIT-II :*** | |
| **UNIT V - ELECTROMAGNETIC WAVES** | | | | **(Target Periods :9+3)** |
| 32. | | | Electromagnetic wave Generation and equations | T1[430- 432] |
| 33. | | | Wave parameters – velocity – intrinsic impedance – propagation constant | T1[436- 437] |
| 34. | | | Waves in free space, Lossy and lossless dielectrics – conductors-skin depth, | T1[436- 445] |
| 35. | | | Poynting vector | T1[454- 458] |
| 36. | | | Plane wave reflection and refraction, standing wave, Applications | T1[459- 462] |
| 37. | | | Tutorial | |

| | | | | |
|---|---|---|---|---|
| 38. | | | *Content Beyond Syllabus:* Electromagnetic Interference (EMI) | |
| 39. | | | Quiz(I & II) | |
| **Total Planned Periods: 12** | | | | |
| ***CIT-III :*** | | | | |
| NPTEL Website: http://nptel.ac.in/courses/108106073/ | | | | |

**Text /Reference Book**

| S.No | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|
| T1 | Elements of Electromagnetics | Mathew N.O .Sadiku | Oxford University | 2009 |
| T2 | Electromagnetism- Theory and applications | Ashutosh Pramanik | Prentice Hall | 2006 |
| T3 | Electromagnetic Field Theory | K.A. Gangadhar, P.M. Ramanthan | Khanna Publications | 2007 |
| R1 | Schaum's Series Theory and Problems of Electromagnetics Second Edition, | Joseph A. Edminister | Tata McGraw-Hill | 2006 |
| R2 | Engineering Electromagnetics | William H. Hayt | Tata McGraw Hill | 2001 |
| R3 | Electromagnetics with Applications, | Kraus and Fleish | McGraw-Hill | 1999 |
| R4 | Electromagnetic field theory Fundamentals | Bhag Singh Guru and Hüseyin R. | Cambridge University Press | 2009 |

| Content Beyond Syllabus Added(CBS) | POs | Unit |
|---|---|---|
| Electromagnetic Interference (EMI) | PO6 (**2**) | V |

| **Course** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C203.1 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | - | - |
| C203.2 | 3 | 3 | - | 1 | - | - | - | - | - | - | - | - | 2 | - | - |
| C203.3 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |
| C203.4 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |
| C203.5 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | 2 | - | - |
| C203 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | - | - |

**STAFF INCHARGE** **HOD/EEE**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**
**Lecture Schedule**

Format No.:11
Issue No.: 02
Revision No.: 01
Date: 23/06/12

Degree/Program: **B.E / EEE** Course code: **GE6351**
Semester: III**.** Section : B Course Name: **Environmental Science and Engineering**
Duration: **June -Oct 2017** Staff : Dr. Mahalakshmi M. & Dr. J.Sangeetha
Regulation : **2013(AUC)**

**Aim:** To create awareness in every engineering graduate about the environment& its importance, the effect of technology on the environment and ecological balance.
**Prerequisites:** Technical English I&II, 4th to 9th grade Environmental Science and geography books
**Objectives:**

1. To the study of nature and the facts about environment.
2. To find and implement scientific, technological, economic and political solutions to environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth's interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**COURSE OUTCOMES:** After the course, the student should be able to:

| | | POs | PSOs |
|---|---|---|---|
| C204.1 | Define Environment, ecosystem and biodiversity, classify types of ecosystems and outline the impacts to biodiversity. | **6,9,12** | **2,3** |
| C204.2 | Define pollution, classify its types, analyze the causes and suggest control measures for pollution. | **6,7,8,9,12** | **2,3** |
| C204.3 | Outline various natural resources; explain causes and impacts of destruction of resources. | **6,9,12** | **2,3** |
| C204.4 | List various social issues related to land, water and energy; summarize the concerning government acts and rules to overcome these problems. | **6,7,9,12** | **2,3** |
| C204.5 | Interpret population explosion and variation among nations, show the impacts of over population and illustrate the methods to mitigate the same. | **6,7,8,9,12** | **2,3** |

**Target Periods - 45 Periods** **Curriculum: 3L - 0T- 0P**

| Sl. No | Date | Period No. | Topics to be covered | Book Page No. |
|---|---|---|---|---|
| **Unit - I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** | | | | **Target Periods : 12** |
| 1 | | | Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment | R5(1.2 -1.7) |
| 2 | | | Concept of an ecosystem- Structure and function of an ecosystem ,producers, consumers and decomposers | R5(2.1-2.8) |
| 3 | | | Oxygen cycle and Nitrogen cycle, Energy flow in the ecosystem – Ecological succession process | R5(2.9 -2.17) |
| 4 | | | Introduction, types, characteristic features, structure and function of the forest ecosystem and grassland ecosystem | R5(2.17-2.23) |
| 5 | | | Introduction, types, characteristic features, structure and function of the desert ecosystem and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) | R5(2.24-2.37) |
| 6 | | | Introduction to biodiversity definition: genetic species and ecosystem diversity- Biogeographical classification of India | R5(3.1-3.5) |
| 7 | | | Value of biodiversity: consumptive use, productive use, Social, ethical, aesthetic and option values – Biodiversity at global, national and local levels | R5(3.6-3.17) |
| 8 | | | India as a mega-diversity nation – hot-spots of biodiversity | R5(3.17-3.22) |
| 9 | | | Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts | R5(3.23-3.28) |
| 10 | | | Endangered and endemic species of India, Conservation of biodiversity: In-situ and ex-situ, conservation of biodiversity | R5(3.28-3.40) |
| 11 | | | Field study of common plants, insects, birds. | Notes |

| | | | | |
|---|---|---|---|---|
| 12 | | | Field study of simple ecosystems – pond, river, hill slopes, etc. | Notes |
| Assignment No.: I | | | | |
| **Unit II ENVIRONMENTAL POLLUTION Target Periods :10** | | | | |
| 13 | | | Definition – causes, effects and control measures of air pollution(Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN | R5(4.1-4.14) |
| 14 | | | Acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO2, NOX, CO and HC) | R5(4.14- 4.24) |
| 15 | | | Water pollution: Physical and chemical properties of terrestrial and marine water and their environmental significance; | R5(4.24-4.27) R5(4.36-4.44) |
| 16 | | | Water quality parameters – physical, chemical and biological | R5(4.27-4.36) |
| 17 | | | absorption of heavy metals - Water treatment processes. | R5(4.44-4.54) |
| 18 | | | Soil pollution - soil waste management: causes | R5(4.54-4.64) |
| 19 | | | Effects and control measures of municipal solid wastes | R5(4.64-4.70) |
| 20 | | | Causes, effects and control measures of Noise pollution, and Marine pollution | R5(4.71-4.80) |
| 21 | | | Causes, effects and control measures of Thermal pollution and Nuclear hazards | R5(4.80-4.91) |
| 22 | | | Role of an individual in prevention of pollution | R5(4.91-4.93) |
| | | | Seminar-I & II | |
| Assignment No.: II | | | | |
| **Unit III NATURAL RESOURCES Target Periods : 10** | | | | |
| 23 | | | Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, | R5(5.1-5.15) |
| 24 | | | mining, dams and their effects on forests and tribal people | |
| 25 | | | Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems | R5(5.15-5.21) |
| 26 | | | Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies | R5(5.22-5.33) |
| 27 | | | Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies | R5(5.33-5.42) |
| 28 | | | Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. | R5(5.43-5.68) |
| 29 | | | Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies | |
| 30 | | | Land as a resource, land degradation, man induced landslides, soil erosion and desertification | R5(5.68-5.76) |
| 31 | | | Role of an individual in conservation of natural resources Equitable use of resources for sustainable lifestyles | R5(5.76-5.80) |
| 32 | | | Introduction to Environmental Biochemistry: Proteins – Biochemical degradation of pollutants, Bioconversion of pollutants. | R5(5.80-5.86) |
| | | | Seminar-III &IV | |
| Assignment No.: III | | | | |
| **Unit IV SOCIAL ISSUES AND THE ENVIRONMENT Target Periods : 07** | | | | |
| 33 | | | From Unsustainable to sustainable development - Urban Problems Related to energy – Water conservation, Rain Water Harvesting | R5(6.1-6.10) |
| 34 | | | Watershed Management – Resettlement and Rehabilitation of People, Its Problems and Concerns, Case Studies, Environmental Ethics:- Issues and Possible Solutions | R5(6.11-6.22) |

| | | | | |
|---|---|---|---|---|
| 35 | | | Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies | R5(6.22- 6.28) |
| 36 | | | Wasteland Reclamation – Consumerism and Waste Products | R5(6.28- 6.34) |
| 37 | | | Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act | R5(6.34-6.38) |
| 38 | | | Wildlife Protection Act – Forest Conservation Act | R5(6.38-6.46) |
| 39 | | | Issues Involved in enforcement of Environmental Legislation – Public Awareness | R5(6.46-6.61) |
| **Unit-V HUMAN POPULATION AND THE ENVIRONMENT Target Periods : 06** | | | | |
| 40 | | | Population Growth, Variation among Nations - Population Explosion | R5(7.1-7.11) |
| 41 | | | Family Welfare Programme- Environment and Human Health | R5(7.11-7.17) |
| 42 | | | Human Rights- Value Education- HIV /AIDS | R5(7.17-7.28) |
| 43 | | | Women and Child Welfare | R5(7.28-7.32) |
| 44 | | | Role of Information Technology in Environment and Human Health – Case Studies | R5(7.3-7.41) |
| 45 | | | Revision | |
| | | | Quiz | |

**NPTEL LECTURES**

| S. No | UNIT | Date[Period] | TOPIC | Ref / Link |
|---|---|---|---|---|
| 1 | | | Air pollution control devices | http://www.gaurishsharma.com/2008/11/nptelhigh-quality-free-video-tutorials.html |
| 2 | | | Waste water engineering | |

**Text Books and References**

| S. No | | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|---|
| 1 | **T1** | Introduction to Environmental Engineering and Science, 2nd edition | Gilbert M.Masters | earson Education | 2004. |
| 2 | **T2** | Environmental Science and Engineering | Benny Joseph | Tata McGraw-Hill, New Delhi | 2006 |
| 3 | **R1** | Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards Vol. I and II | R.K. Trivedi | Enviro Media | 2006 |
| 4 | **R2** | Environmental Encyclopedia | Cunningham, W.P. Cooper, T.H. Gorhani | Jaico Publ., House, Mumbai, 2001. | 2006 |
| 5 | **R3** | Environmental law | . Dharmendra S. Sengar | Prentice hall of India, New Delhi | 2007 |
| 6 | **R4** | Environmental Studies-From Crisis to Cure | | Oxford University Press | 2005 |
| 7 | **R5** | Environmental Science and Engineering | A.Ravikrishnan | Srikrishna Hitech Publishing company Pvt.Ltd | 2014 |

Mapping of CO's and PO's

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C204.1 | - | - | - | - | - | 3 | - | - | 1 | - | - | 2 | - | 1 | 1 |
| C204.2 | - | - | - | - | - | 3 | 1 | 1 | 1 | - | - | 3 | - | 1 | 1 |
| C204.3 | - | - | - | - | - | 3 | - | - | 1 | - | - | 3 | - | 1 | 1 |
| C204.4 | - | - | - | - | - | 3 | 2 | - | 1 | - | - | 3 | - | 1 | 1 |
| C204.5 | - | - | - | - | - | 3 | 2 | 1 | 1 | - | - | 3 | - | 1 | 1 |
| C204 | - | - | - | - | - | 3 | 1 | 1 | 1 | - | - | 3 | - | 1 | 1 |

| Content Beyond Syllabus Added(CBS) | POs strengthened / vacant filled | CO / Unit |
|---|---|---|
| Ethics and Moral values | PO8(2) Strengthened | C204.5/V |
| Team based activities | PO9(2) & PO10(2) Strengthened & Vacant filled | C204.2/II,C204.5/V |

**Faculty In-Charge** **HOD/EEE**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**

**Lecture Schedule**

Degree/Programme : **B.E / EEE**

Course code & Name : **EC6202 & Electronic Devices and Circuits** Duration : **Jun-Oct 2017.**

Semester : **III** Section : **A & B** Staff : **M. Jeyamurugan** Regulation : **2013/AUC**

**AIM:**

- To explain the structure of the basic electronic devices.
- To design applications using the basic electronic devices.

**OBJECTIVES:** The student should be made to:

- Be explaining with the structure of basic electronic devices.
- Be design to the basic electronic devices applications.

**Prerequisites:** Circuit theory

**COURSE OUTCOMES:** After the course, the student should be able to

| CO | Course Outcomes | POs | PSOs |
|---|---|---|---|
| C205.1 | Draw the characteristics of various types of Diodes, design Half and Full wave Rectifier. | 1,2,3,4 | 1 |
| C205.2 | Compare the different configurations of BJT, draw its characteristics. | 1,2,3,4 | 1 |
| C205.3 | Calculate the FET parameters, draw its frequency response characteristics. | 1,2,3,4,6 | 1 |
| C205.4 | Design amplifier circuits and draw frequency response characteristics | 1,2,3,4,6 | 1 |
| C205.5 | Develop the parameters of feedback amplifier circuit, describe different types of oscillator circuits | 1,2,3,4,6 | 1 |

| S. No | Date | Period Number | Topics to be Covered | Book No [Page No] | |
|---|---|---|---|---|---|
| **UNIT – I : PN JUNCTION DEVICES** | | | | **Target Periods : 9+3=12** | |
| 1 | | | **PN junction diode –** circuit symbol, theory, application **Structure –**Barrier voltage, Depletion region, drift & diffusion current, Junction of P – type & N – type **operation -** Forward and reverse biased junction | T1[10] T1[16] T1[20] T1[23] | R7(1.1) |
| 2 | | | **V-I characteristics -** Forward and reverse characteristics, breakdown, diode parameters, equivalent circuit, temperature effect | T1[34] T1[41] T1[47] | R7(1.5) |
| 3 | | | **Diffusion (storage) capacitance -** calculation of $C_D$ **Transition capacitance** - calculation of $C_T$ | T1[50] | R7(1.10,14) |
| 4 | | | Tutorial-1 | - | - |
| 5 | | | **Rectifiers** – Introduction, types, basic circuit, input & output waveforms, analysis and comparison, application. **Half Wave Rectifier –** Positive & Negative HWR | T1[71] T1[72] | R7(1.16) |
| 6 | | | **Full Wave Rectifier –** Two diode FWR, Bridge Rectifier | T1[75] | R7(1.23,29) |
| 7 | | | Tutorial-2 | - | - |
| 8 | | | **Display devices- LED –** symbol, construction, operation, characteristics, parameters, application. | T1[945] T1[952] | R7(1.37) |
| 9 | | | **Laser diodes** - symbol, structure, operation, characteristics, parameters, application. | T1[981] | R7(1.40) |
| 10 | | | **Zener diode characteristics -** circuit symbol, equivalent circuit, operation, characteristics, application **Zener Reverse characteristics –** Avalanche & zener Breakdown mechanism, Zener resistance & ratings | T1[59] | R7(1.43,45) |
| 11 | | | **Zener as regulator** – circuit with no load & loaded regulator, performance | T1[108] | R7(1.48) |
| 12 | | | Tutorial-3 | - | - |
| **Total Periods:** | | **12** | ***Assignment - I*** | *Date of Submission :10.7.17* | |
| ***18.7.17*** | | ***1*** | ***Test – I - CT-I: 12.7.17 – 19.7.17*** | ***Portion :*** *Unit – 1* | |
| **UNIT – II : TRANSISTORS** | | | | **Target Periods : 9+3=12** | |
| 13 | | | **BJT- structure -** PNP & NPN construction, biasing **operation –** PNP & NPN - transistor configuration and operation, transistor as an amplifier, comparison **characteristics –** CE, CB & CC configuration circuit, current gain characteristics, h-parameters | T1[143] | R7(2.2) |
| 14 | | | **BJT Biasing –** needs of biasing, DC Load line, Q point, thermal runaway, methods & comparison of biasing | T1[180] | R7(2.68) |
| 15 | | | Tutorial-4 | - | - |

| | | | | | |
|---|---|---|---|---|---|
| 16 | | | **JFET- structure –** P channel & N channel, application<br>**Operation -** P channel & N channel, comparison<br>**Characteristics –** depletion region, CS, CD & CG configuration, Transfer and drain characteristics with $V_{GS}$ = 0v & external bias | T1[345] | R7(2.27) |
| 17 | | | **JFET Biasing -** DC Load line, Q point, effect of source resistor, methods & comparison of biasing | T1[380] | R7(2.125) |
| 18 | | | Tutorial-5 | - | - |
| 19 | | | **MOSFET- structure –** N channel and P channel of E-MOSFET & D-MOSFET<br>**Operation & characteristics -** E-MOSFET & D-MOSFET, comparison | T1[367] | R7(2.40) |
| 20 | | | **MOSFET Biasing -** methods & comparison of biasing | T1[417] | R7(2.152) |
| 21 | | | Tutorial-6 | - | - |
| 22 | | | **UJT – Structure** - circuit symbol, equivalent circuit<br>**Characteristics -** operation, parameter,<br>UJT relaxation oscillator – frequency of oscillation | T1[927] | R7(2.174) |
| 23 | | | **Thyristor –** Introduction, PNPN diode analogy, SCR control circuits, applications<br>**Structure and characteristics** of SCR | T1[893] | R7(2.182) |
| 24 | | | **IGBT** – symbol**,**<br>**Structure and characteristics -** operation | - | R7(2.200) |
| 25 | | | *Tutorial* | - | - |
| **Total Periods:** | | **12+1** | ***Assignment - II*** | *Date of Submission :12.8.17* | |
| ***6.8.17*** | | ***1,2*** | ***Test – II - CIT-II: 31.7.17-7.8.17*** | ***Portion :*** *Unit –I, II* | |
| **UNIT – III : AMPLIFIERS** | | | | **Target Periods : 9+3=12** | |
| 26 | | | **BJT small signal model –** Two port network, hybrid parameter, hybrid model for different configurations, classification of BJT amplifier, analysis of transistor amplifier circuit using h parameters, characteristics, comparison, application | T1[238] | R7(3.1) |
| 27 | | | **Analysis of CE amplifiers –** Single stage circuit, hybrid parameter equivalent circuit, input impedance, output impedance, voltage gain, current gain | T1[254] | R7(3.27) |
| 28 | | | Tutorial-7 | | |
| 29 | | | **Analysis of CB amplifiers –** Single stage circuit, hybrid parameter equivalent circuit, input impedance, output impedance, voltage gain, current gain | T1[268] | R7(3.40) |
| 30 | | | **Analysis of CC amplifiers –** Single stage circuit, hybrid parameter equivalent circuit, input impedance, output impedance, voltage gain, current gain | T1[263] | R7(3.43) |
| 31 | | | Tutorial-8 | | |
| 32 | | | **MOSFET small signal model -** , hybrid model for different configurations, comparison | T1[435] | R7(3.70) |
| 33 | | | **Analysis of CS -** Single stage circuit, hybrid parameter equivalent circuit, input impedance, output impedance, voltage gain, current gain | T1[439] | R7(3.78) |
| 34 | | | **Analysis of Source follower -** Single stage circuit, hybrid parameter equivalent circuit, input impedance, output impedance, voltage gain, current gain | T1[448] | R7(3.82) |
| 35 | | | Tutorial-9 | - | - |
| 36 | | | **Gain and frequency response –** cut off frequency, Bandwidth, miller effect, effect of Coupling and bypass capacitor , low frequency response of BJT | T1[314] | R7(3.52) |
| 37 | | | **High frequency analysis** - frequency response of FET | T1[460] | R7(3.90) |
| 38 | | | *Tutorial* | - | - |
| **Total Periods:** | | **12+1** | ***Assignment - III*** | *Date of Submission :18.8.17* | |
| ***27.8.17*** | | ***1*** | ***Test – III - CT-II: 21.8.17-28.8.17*** | ***Portion :*** *Unit – III* | |
| **UNIT – IV : MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER** | | | | **Target Periods : 9+3=12** | |
| 39 | | | **BIMOS cascade amplifier –** block diagram, coupling schemes, BJT-FET consideration, general analysis | T1[505] | R7(4.1) |
| 40 | | | **Differential amplifier –** voltage gain, CMRR, DC analysis of differential amplifier using BJT classification | T1[510] | R7(4.2) |
| 41 | | | **Common mode and Difference mode analysis –** AC analysis, | | R7(4.4,9) |

| | | | | | |
|---|---|---|---|---|---|
| | | | approximate h-model, input & output impedance | | |
| 42 | | | **FET input stages** – DC & AC analysis of JFET source coupled pair | R6[361] | R7(4.25) |
| 43 | | | Tutorial-10 | - | - |
| 44 | | | **Single tuned amplifiers –** ideal circuit, Q factor, capacitor coupled load | T1[524] | R7(4.31) |
| 45 | | | **Gain and frequency response** – double tuned circuits, comparison, application | | R7(4.1) |
| 46 | | | **Neutralization methods -** operation | R6[482] | R7(4.40) |
| 47 | | | Tutorial-11 | - | - |
| 48 | | | **Power amplifiers – types** - Circuit diagram, operation, advantages, disadvantages, application | T1[807] | R7(4.42) |
| 49 | | | **Qualitative analysis of Power amplifiers –** efficiency, distortion | | R7(4.48) |
| 50 | | | Tutorial-12 | - | - |
| **Total Periods:** | | **12** | *Quiz* | C205.4 | - |
| ***16.9.17*** | | ***1,2*** | ***Test – IV - CIT-II: 11.9.17-18.9.17*** | ***Portion :*** *Unit – III,IV* | |
| **UNIT – V : FEEDBACK AMPLIFIERS AND OSCILLATORS** | | | | **Target Periods : 9+3=12** | |
| 51 | | | **Advantages of negative feedback Amplifier –** basic concept, classification, characteristics | T1[544] | R7(5.10) |
| 52 | | | **Voltage series feedback –** identifying topology, to find the i/p & o/p circuit, A & β, D, $A_f$, $R_{if}$, $R_{of}$ | T1[545] | R7(5.8,29) |
| 53 | | | **Current series feedback –** identifying topology, to find the i/p & o/p circuit, A & β, D, $A_f$, $R_{if}$, $R_{of}$ | T1[569] | R7(5.8,31) |
| 54 | | | Tutorial-13 | | |
| 55 | | | **Voltage shunt feedback –** identifying topology, to find the i/p & o/p circuit, A & β, D, $A_f$, $R_{if}$, $R_{of}$ | R6[570] | R7(5.9,37) |
| 56 | | | **Current shunt feedback –** identifying topology, to find the i/p & o/p circuit, A & β, D, $A_f$, $R_{if}$, $R_{of}$ | T1[576] | R7(5.9,34) |
| 57 | | | Tutorial-14 | - | - |
| 58 | | | **Positive feedback -** classification, **Condition for oscillations** | R6[508] | R7(5.43,45) |
| 59 | | | **Phase shift oscillators, Wien bridge oscillators** - circuit diagram, working, analysis, advantages, disadvantages, application | R6[593] | R7(5.48,61) |
| 60 | | | **Hartley, Colpitts oscillators –** general form of LC oscillator, circuit diagram, working, analysis, advantages, disadvantages, application | R6[580] | R7(5.80,86) |
| 61 | | | **Crystal oscillators** - circuit diagram, working, analysis, advantages, disadvantages, application | R6[609] | R7(5.97) |
| 62 | | | Tutorial-15 | - | - |
| **Total Periods:** | | **12** | *Seminar* | C205.5 | - |
| ***5.10.17*** | | ***1*** | ***Test – V - CT-III: 3.10.17-5.10.17*** | ***Portion :*** *Unit – V* | |
| 63 | | | *CBS : Diode, Transistor testing & Evaluation* | *CO205.1, CO205.2* | *PO5,PO7* |
| 64 | | | *NPTEL : BJT Small signal analysis – Module 2 – lecture 5* | *CO205.3* | - |
| 65 | 24.10.17 | FN | ***Model Test: 14.10.17 – 25.10.17*** | ***Portion :*** *5 Units* | |

**NPTEL:**

| Unit | http://nptel.ac.in/courses/webcourse-contents/electronics/ | | Module No. | Lecture No. |
|---|---|---|---|---|
| I | PN Diode | IIT, Kharagpur | 01 | 02 |
| | LED | IIT, Bombay | 01 | 31 |
| II | BJT | IIT, Kharagpur | 01 | 03 |
| III | FET & MOSFET | IIT, Delhi | 05 | 02 |
| IV | Differential Amplifiers | IIT, Delhi | 07 | 09 |
| V | Feedback configurations & Multistage amplifier | IIT, Delhi | 01 | 04 |
| | Oscillators | IIT, Madras | 02 | 10 |

**Books: Text-(T) / Reference-(R)**

| S. No | | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|---|
| 1 | **T1** | Electronic Devices and Circuits | David A. Bell | Prentice Hall of India | 2004 |
| 2 | **T2** | Microelectronic Circuits | Sedra and smith | Oxford University Press | 2004 |
| 3 | **R1** | Micro Electronic Circuits | Rashid | Thomson publications | 1999 |
| 4 | **R2** | Electron Devices | Floyd | Pearson Asia 5th Edition | 2001 |
| 5 | **R3** | Electronic Circuit Analysis and Design | Donald A Neamen | Tata McGraw Hill, 3rd Edition | 2003 |
| 6 | **R4** | Electronic Devices and Circuit theory | Robert L.Boylestad | | 2002 |
| 7 | **R5** | Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation | Robert B. Northrop | CRC Press | 2004 |
| *8* | ***R6*** | *Electronic Devices and Circuits* | *S.Shalivahanan N.Suresh Kumar* | *McGraw Hill Education (India) Pvt. Ltd, 3rd Edition* | *2014* |
| *9* | ***R7*** | *Electronic Devices and Circuits* | *T.Joel* | *Sruthi Publishers* | *2014* |

**Mapping of Course Outcomes (COs) , Course (C), Program Specific Outcomes (PSOs) with Program Outcomes. (POs) – Before CBS**

| **Course** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C205.1 | 2 | 1 | 1 | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C205.2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| C205.3 | 2 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | 2 | - | - |
| C205.4 | 2 | 2 | 1 | 2 | - | 1 | - | - | - | - | - | - | 2 | - | - |
| C205.5 | 2 | 3 | 1 | 2 | - | 1 | - | - | - | - | - | - | 2 | - | - |
| C205 | 2 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | 2 | - | - |

| Content Beyond Syllabus Added(CBS) | POs strengthened / vacant filled | CO / Unit |
|---|---|---|
| Diode testing & Evaluation - Demonstration | PO5,PO7-(1) / vacant filled | C205.1 / I |
| Transistor testing & Evaluation - Demonstration | PO5,PO7-(1) / vacant filled | C205.2 / II |

**STAFF INCHARGE** **HOD/EEE**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM - 630 612**

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**Lecture Schedule**

| | | | | | |
|---|---|---|---|---|---|
| Course/Branch | : | **B.E / EEE** | Subject | : | **Linear Integrated Circuits & Applications** |
| Duration | : | **July – Oct 2017** | Subject Code | : | **EE6303** |
| Semester | : | **III** Section : **A&B** | Staff Handling | : | **S. Rajalingam** |
| Regulation | : | **2013 [AUC]** | | | |

**AIM**

To expose the students to the concepts of fabrication of ICs, characteristics & applications of OP-AMP, functions of special ICs & its applications.

**OBJECTIVES**

**The students should be made:**

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using OP-amp ICs.
- To study the applications of OP-amp.
- To study the internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

**PRE-REQUISITE :** Circuit Theory

**COURSE OUTCOMES:** After the course, the student should be able to:

| Course | Course Outcome | POs | PSOs |
|---|---|---|---|
| C206.1 | Explain the procedure for the fabrication of IC. | 1,2,3,6,12 | 1 |
| C206.2 | Summarize the DC & AC characteristics of Operational amplifier. | | |
| C206.3 | Discuss the applications of Operational amplifier. | | |
| C206.4 | Describe the internal functional blocks of special ICs like Timer and PLL. | | |
| C206.5 | Classify types of voltage regulators and describe the special ICs. | | |

**Target Periods - 45 Periods** **Curriculum: 3L - 0T- 0P**

| S.No. | Date | Period Number | Topics to be Covered | Book No [Page No] |
|---|---|---|---|---|
| **UNIT I** | | | **IC FABRICATION** **Target Periods : 10 + 1** | |
| 1. | | | Introduction | T2 (01-02) |
| 2. | | | IC classification | T2 (01-02) |
| 3. | | | Fundamental of monolithic IC technology | T2 (03-04) |
| 4. | | | Epitaxial growth | T2 (06) |
| 5. | | | Masking and Etching, Diffusion of impurities | T2 (07-09) |
| 6. | | | Realization of monolithic ICs and packaging | T2 (12-13) |
| 7. | | | Fabrication of Diodes | T2 (20-25) |
| 8. | | | Fabrication of Resistance | T2 (20-25) |
| 9. | | | Fabrication of Capacitance | T2 (25-27) |
| 10 | | | Fabrication of FETs | T2 (27-30) |
| 11. | | | ***Technical Quiz – I*** | |
| **UNIT II** | | | **CHARACTERISTICS OF OP-AMP** **Target periods : 11 + 1** | |
| 12. | | | Ideal OP – AMP characteristics | T2 (41-52) |
| 13. | | | DC characteristics: Offset voltage, current, bias current | T2 (104-111) |
| 14. | | | | |
| 15. | | | AC characteristics: Gain Bandwidth, Slew rate | T2 (111-127) |
| 16. | | | Differential Amplifier | T2 (50 - 52) |
| 17. | | | Frequency response of OP-AMP | T2 (112-114) |

| | | | | |
|---|---|---|---|---|
| 18. | | | Basic applications of op-amp: Inverting Amplifier, Non-Inverting Amplifier | T3 (90)<br>T3 (102) |
| 19. | | | V/I and I/V converters | T2 (146 - 147) |
| 20. | | | Summer circuit | T2 (135-137) |
| 21. | | | Differentiator | T2 (164-168) |
| 22. | | | Integrator | T2 (168 – 175) |
| 23. | | | ***Technical Seminar – I*** | |
| **UNIT-III** | | | **APPLICATIONS OF OP-AMP** | |
| **Target Periods : 12 + 1** | | | | |
| 24. | | | Instrumentation amplifier | T2 (141-144) |
| 25. | | | Log and Antilog Amplifiers | T2(155 - 159) |
| 26. | | | First and second order active filters | T2 (262-282) |
| 27. | | | Comparators | T2 (207-212) |
| 28. | | | Multivibrators | T2 (216-220) |
| 29. | | | Waveform generators | T2 (220-222) |
| 30. | | | Clippers, Clampers & Peak detector | T2 (151-153) |
| 31. | | | S/H circuit | T2 (153-154) |
| 32. | | | D/A converter (R – 2R ladder and weighted resistor types) | T2 (349-357) |
| 33. | | | | |
| 34. | | | A/D converter using op-amp | T2 (357-366) |
| 35. | | | | |
| 36. | | | **Content Beyond Syllabus:** "Design and implementation of Linear ICs for Industrial applications". | |
| **UNIT IV** | | | **SPECIAL ICs** | **Target Periods: 9 + 1** |
| 37. | | | 555 Timer circuit – Functional block | T2 (311-312) |
| 38. | | | 555 Timer- Characteristics and applications | T2 (312-324) |
| 39. | | | | |
| 40. | | | IC 566 – Voltage controlled oscillator circuit | T2 (334-336) |
| 41. | | | | |
| 42. | | | IC 565 – Phase lock loop circuit functioning | T2 (337-342) |
| 43. | | | | |
| 44. | | | IC 565 – Applications | T2 (342-345) |
| 45. | | | Analog multiplier ICs | T2 (159-160) |
| 46. | | | ***Technical Seminar - II*** | |
| **UNIT V** | | | **APPLICATION ICs** | **Target Periods: 9 + 1** |
| 47. | | | IC voltage regulators LM78XX / 79XX | T2 (241-248) |
| 48. | | | | |
| 49. | | | LM317 – Fixed voltage regulators | T3 (457) |
| 50. | | | IC 723 Variable voltage regulators | T2 (248-255) |
| 51. | | | Switching regulator | T2 (255-258) |
| 52. | | | SMPS | T3 (466) |
| 53. | | | LM 380 power amplifier | T3 (447) |
| 54. | | | ICL 8038 function generator IC | T3 (497) |
| 55. | | | | |
| 56. | | | ***Technical Quiz - II*** | |

**Books: Text/Reference**

| S.No. | | Title of the Book | Author | Publisher | Year |
|---|---|---|---|---|---|
| 1. | T1 | OP-AMP & Linear ICs | David A. Bell | Oxford | 2013 |
| 2. | T2 | Linear Integrated Circuits | D. Roy Choudhary, Sheil B.Jani | New Age ( IV Edition) | 2003 |
| 3. | T3 | OP-AMPS and Linear Integrated Circuits | Ramakant A. Gayakward | Pearson Education/PHI (IV Edition) | 2003 |
| 4. | R1 | OP-AMPs & Linear Integrated Circuits Concepts & Applications | Fiore | Cengage | 2010 |
| 5. | R2 | Fundamentals of Analog Circuits | Floyd, Buchla | Pearson | 2013 |
| 6. | R3 | Integrated Electronics - Analog and Digital Circuits System | Jacob Millman, Christos C.Halkias | Tata McGraw Hill | 2003 |
| 7. | R4 | OP - AMP and Linear ICs | Robert F. Coughlin, Fredrick F. Driscoll | PHI Learning, (VI Edition) | 2012 |

**NPTEL LECTURES**

| S. No | UNIT | Date[Period] | TOPIC | Ref / Link |
|---|---|---|---|---|
| 1 | II | 04.10.16[1] | Ideal Operational Amplifier | http://www.youtube.com/watch?v=uHQmNWbtwHU |
| 2 | III | 05.10.16[2] | Applications of OP-AMP | http://www.youtube.com/watch?v=nqk714QpRos |
| 3 | IV | 06.10.16[3] | Voltage Controlled Oscillator | https://www.youtube.com/watch?feature=player_embedded&v=KeNUgpw8-yM |

**SELF-STUDY TOPICS**

| S. No | UNIT | TOPIC | Books to be referred |
|---|---|---|---|
| 1 | II | Adder - Subtractor | Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV Edition, Pearson Education, 2003 / PHI. 2000. |
| 2 | III | Triangular Wave Generator | D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', IV Edition, New Age, 2003. |
| 3 | V | Advantages & Disadvantages of SMPS | David A.Bell, 'Op-amp & Linear ICs', Oxford, 2013 |

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C206.1 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | **1** | 1 | - | - |
| C206.2 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 1 | - | - |
| C206.3 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 1 | - | - |
| C206.4 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 1 | - | - |
| C206.5 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 1 | - | - |
| C206 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 1 | - | - |

| Content Beyond Syllabus Added(CBS) | POs strengthened / vacant filled | CO / Unit |
|---|---|---|
| Design & Implementation of Linear ICs for Industrial applications | PO3(2) (Strengthened) & PO9(1) (vacant filled) | C206.3 / III |

**K.L.N.COLLEGE OF ENGINEERING –POTTAPALAYAM**

**DEPARTMENT OF MATHEMATICS**

**Sub code/ Subject: MA6351- Transforms and Partial differential equations**

**IMPORTANT PART –A & PART –B QUESTIONS**

**UNIT-I PARTIAL DIFFERENTIAL EQUATIONS**

**PART-A**

1.Form a partial differential equation by eliminating the arbitrary constants 'a' and 'b' from $Z = (x^2 + a^2)(y^2 + b^2)$.

2. Form a partial differential equation by eliminating the arbitrary constants 'a' and 'b' from $\log(az-1) = x + ay + b$.

3. Find the partial differential equation of all sphere whose centre lie on the x axis.

4. Form a partial Differential Equation by eliminating the arbitrary function from the relation $Z = xy + f(x^2 + y^2)$

5. Form the partial differential equation by eliminating the arbitrary function 'f' from $\mathbf{z = e^{ay} f(x+by)}$

6. Find the General solution of $\frac{\partial^2 z}{\partial x^2} = 0$

7.Find the complete integral of $\frac{z}{pq} = \frac{x}{q} + \frac{y}{p} + \sqrt{pq}$

8.Solve : $(D^4\text{-}D'^4)z = 0$

9.Find the particular integral of $\left[D^2 + 3DD' + 2D'^2\right]z = x + y$

10.Solve $\left(D + D' - 1\right)\left(D - 2D' + 3\right)z = 0$

**PART-B**

1. Find the partial differential equations of all planes which are at a constant distance 'k' units from the origin.
2. Form the partial differential equation by eliminating the arbitrary function 'f' and '$\phi$' from the relation $z = xf\left(\frac{y}{x}\right) + y\phi(x)$.
3. Find the singular integral if $z = px + qy + \sqrt{1 + p^2 + q^2}$
4. Solve $z = px + qy + p^2q^2$ and obtain its singular solution.

5. Solve $z^2 = 1 + p^2 + q^2$ .

6. Solve $p^2y(1 + x^2) = qx^2$ .

7. Solve the Lagrange's equation $\left(x^2 - yz\right)p + \left(y^2 - zx\right)q = z^2 - xy$ .

8. Solve the Lagrange's equation $\left(z^2 - 2yx - y^2\right)p + (xy + zx)q = xy - zx$.

9. Solve $\left(D^2 + 2DD' + D'^2\right)z = x^2y + e^{x-y}$

10. Solve $\left(D^3 - 7DD'^2 - 6D'^3\right)z = \sin(x + 2y)$

## UNIT-II FOURIER SERIES

## PART-A

**1.** State the sufficient conditions for the existence of Fourier series.

2. If $(\pi - x)^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$ in $0 < X < 2\pi$, then deduce that the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$.

3. The instantaneous current at time of an alternating current wave is given by

$i = I_1\sin(\omega t + \alpha_1) + I_3\sin(3\omega t + \alpha_3) + I_5\sin(5\omega t + \alpha_5) + \ldots$. Find the effective value of the current 'i' □

4. If the Fourier series of the function $f(x)=x$, $-\pi<x<\pi$ with period $2\pi$ is given by $f(x) = 2\left(\sin x - \frac{\sin 2x}{2} + \frac{\sin 3x}{2} - \frac{\sin 4x}{2} + \cdots\right)$, then find the sum of the series $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

5. Find the root mean square value of $f(x) = x(l-x)$ in $0 \le x \le l$

6. Find the sine series of function $f(x)=1$, $0 \le x \le \pi$.

7. Find the sum of the Fourier series for $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2, & 1 < x < 2 \end{cases}$ at $x = 1$

8. Determine $b_n$ in the Fourier series expansion of $f(x) = \frac{1}{2}(\pi - x)$ in $0 < x < 2\pi$ with period $2\pi$

9. If the Fourier series of the function $f(x)=x+x^2$ in the interval $(-\pi, \pi)$ is $\frac{\pi^2}{3} + \sum_{n=1}^{\infty}(-1)^n \left(\frac{4}{n^2}\cos nx - \frac{2}{n}\sin nx\right)$, then find the value of the series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots..$

10. What do you mean by harmonic analysis?

## PART-B

**1.** Find the Fourier series of $f(x) = x^2$ $-\pi<x<\pi$, Hence deduce the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$.

2. Find the half range cosine series expansion of $(x-1)^2$ in $0<x<1$.

3. Compute the first two harmonics of the Fourier series of f(x) from

| x | 0 | $\frac{\pi}{3}$ | $\frac{2\pi}{3}$ | $\frac{3\pi}{3}$ | $\frac{4\pi}{3}$ | $\frac{5\pi}{3}$ | $\frac{6\pi}{3}$ |
|---|---|---|---|---|---|---|---|
| y | 1.0 | 1.4 | 1.9 | 1.7 | 1.5 | 1.2 | 1.0 |

4. Obtain the Fourier cosine series expansion of $f(x)=x$ in $0 < x < 4$. Hence deduce the value of $\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots.$

5. Find the Fourier series expansion of $f(x) = |\sin x|$ in $-\pi < x < \pi$ of periodicity $2\pi$.

6. Find the complex form of the Fourier series $f(x) = e^{-x}$ in $-1<x<1$.

7. Find the complex form of $f(x)=e^{ax}$ in the interval $(-\pi, \pi)$ where a is a real constant. Hence

deduce that $\sum_{n=1}^{\infty} \frac{(-1)^n}{a^2+b^2} = \frac{\pi}{a\sinh a\pi}$.

8. Find the Fourier series of f (x) = $(\pi - x)^2$in □(0, π) Hence find the sum of the series $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+....$
9. Find the fourier cosine series up to third harmonic for y = f(x) from the following values.

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y | 4 | 8 | 15 | 7 | 6 | 2 |

10. Expand $f(x)=x^2$ as a Fourier series in the interval $(-\pi, \pi)$ and hence deduce that $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\frac{1}{4^4}....=\frac{\pi^4}{90}$.

## UNIT – III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

### PART-A

1. Classify the Partial Differential Equations $(1-x^2)z_{xx} -2xy\, z_{xy} + (1-y^2)u_{yy}+ xz_x + 3x^2y\, z_y -2z = 0$.
2. Write down various possible solutions of one dimensional heat flow equations.
3. Solve the equations $3x \frac{\partial u}{\partial x} - 2y \frac{\partial u}{\partial y} = 0$ by the method of separation of variables.
4. Write all possible solutions of two dimensional heat equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.
5. A rod 30 cm long has its end A and B kept at $20^0$C and $80^0$C respectively, until steady state conditions prevail. Determine the temperature when steady state prevails.
6. State the three possible solutions of the one dimensional heat flow (unsteady state) equation. Classify the p.d.e $u_{xx} + u_{xy} = f(x,y)$ .
7. State the assumptions in deriving one dimensional wave equation.
8. Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x,0) = 6^{e-3x}$ .
9. Write down one dimensional heat equation and a suitable separable solution for the same
10. State Fourier law of heat conduction.

### Part-B

1. **A** square plate is bounded by the lines x=0, x=a, y=0 and y=b. If surfaces are insulated and the temperature along y=b is kept at 100° C while the temperature along other three edges at 0°C Find the study state temperature at any point in the plate.
2. A tightly stretched string with fixed end points x=0 and x=l is initially at rest in it equilibrium position and motion is started by giving each of its points is given a

velocity $V = \begin{cases} \frac{2kx}{l} & 0 < x < \frac{l}{2} \\ \frac{2k(l-x)}{l} & \frac{1}{2} < x < l \end{cases}$ Find the displacement of the string .

3. A metal bar 10cm long with insulated sides has its ends A and B kept at 50℃ and 100 ℃, respectively, until steady state conditions prevail. The temperature at A is suddenly raised at 90℃ at the same time lowered to 60°C at B. Find the resulting temperature distributed in the bar at time t .
4. Solve $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition u(0,t)=0= u(l,t) , t > 0

$u(x,0)=\begin{cases} x & 0 \le x \le \frac{l}{2} \\ (l-x) & \frac{l}{2} < x < l \end{cases}$

5. A string is stretched and fastened to two points l apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ and then released it from this position at time t=0.Find the displacement of the string of the point at a distance of x from one end at time t.
6. A tightly stretched string of length l with fixed end points is initially at rest in its equilibrium position. If it is set vibrating by giving each point a velocity $y_t(x,0)=v_0 \sin\frac{3\pi x}{l}\cos\frac{\pi x}{l}$ where 0<x<l. Find the displacement of the string of the point at a distance of x from one end at time
7. A square plate is bounded by the lines $x = 0$ and $x = 20$ y=0 and $y = 20$ .Its faces areinsulated. The temperature along the upper horizontal edge is given by $u(x, 20) = x(20 - x), 0 < x < 20$ while the other two edges are kept at 0℃. Find the steady state temperature distribution u(x,y) in the plate.
8. Find the displacement of a string stretched with two fixed end points at a distance of 2l apart when the string is initially at rest in its equilibrium position and points of the string are given initial velocities where $v=\frac{x}{l}$ , $\begin{cases} (0,l) \\ \frac{2l-x}{l} \end{cases}$ (l,2l) , x being the distance measured from one end.
9. A tightly stretched string of length 2l is fastened at x=0 and x=2l the midpoint of the string is then taken to height ‘b ‘ transversely and then released in that position. Find the lateral displacement of the string.
10. A rectangular plate with insulated surface is 20cm wide and so long compared to its width that it may be considered infinite in length without introducing appreciable error. The temperature at short edge x=0 is given by $u = \begin{cases} 10y & 0 \le x \le 10 \\ 10(20-y) & 10 \le x \le 20 \end{cases}$ and the two long edges as well as the other short edge are kept at 0℃ .Find the steady state temperature distribution u(x,y) in the plate.

## UNIT-IV FOURIER TRANSFORM

## PART-A

1.Find the Fourier Sine Transform of $f(x) = \frac{1}{x}$

2. State Fourier Integral Theorem

3. State and Prove Shifting Property: $F[f(x-a)] = e^{ias}F(s)$

4. Evaluate $\int_0^\infty \frac{s^2 ds}{(s^2+a^2)(s^2+b^2)}; a > 0; b > 0$

5. Prove that $F[f(ax)] = \frac{1}{|a|}F\left[\frac{s}{a}\right] a > 0$

6. Prove that $F_c[f(ax)] = \frac{1}{a}F_c[\frac{s}{a}]$

7. State Modulation Theorem

8. Find the Fourier Transform of $f(x) = \begin{cases} 1 & in|x| < a \\ 0, & in|x| > a \end{cases}$

9. Prove that $F_c[f(x)cosax] = \frac{1}{2}\,[F_c(s+a) + F_c(s-a)]$

10. If f(x)=$e^{-ax}$ , a<0 find Fourier Sine Transform of f(x)

## PART-B

1. Find the fourier transform of f(x) = $\begin{cases} a^2 - x^2, & |x| < a \\ 0, & |x| > a \end{cases}$ , $a > 0$

Hence evaluate i) $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\,dx$ ii) $\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3}\right)^2 dx$

2. Find the Fourier transform of f(x) if $\mathbf{f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a > 0 \end{cases}}$. Hence deduce that

$$\int_0^\infty \left(\frac{\sin t}{t}\right) dt = \frac{\pi}{2}$$

3.Find the fourier transform of f(x) = $\begin{cases} a - |x| & , |x| < a \\ 0 & , |x| > a \end{cases}$ , $a > 0$

hence deduce that $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt = \frac{\pi}{2}$

4.Find the fourier sine transform of $f(x) = \begin{cases} x, in & 0 < x < 1 \\ 2 - x\ , in & 1 < x < 2 \\ 0\ , in & x > 2 \end{cases}$

5.Find the fourier sine and cosine transform for $x^{n-1}$ and hence deduce that $\frac{1}{\sqrt{x}}$ is self reciprocal under both the transforms. Hence find $F\left(\frac{1}{\sqrt{|x|}}\right)$.

6. Evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$ ; $a, b > 0$

7.Use Parseval's identity for fourier Cosine and Sine transform for $e^{-ax}$

(i) $\int_0^\infty \frac{dx}{(x^2+a^2)^2}$ (ii) $\int_0^\infty \frac{x^2 dx}{(x^2+a^2)^2}$

8. Verify the convolution theorem for fourier transform if f(x) = g(x) = $\mathbf{e^{-x^2}}$

9. Find the fourier Cosine transform of $e^{-a^2x^2}$, $for\ a > 0$

10. Show that $e^{\frac{-x^2}{2}}$ is a self reciprocal with respect to fourier transform.

## UNIT-5 Z-TRANSFORM

## PART-A

1.Find the Z-transform of $n$

2. State the initial value theorem in Z-transform.

3. State Convolution theorem on Z-transform.

4.If $Z\{f(n)\} = \mathrm{F(z)}$,then show that $\mathrm{Z}[a^n f(n)] = F(^z/_a)$

5.Find the Z transform of $\frac{1}{(n+1)}$

6. Find $\mathrm{z}\{(\cos\theta + i\sin\theta)^n\}$

7. Find the Z-transform of $\frac{1}{n!}$

8.Find $\mathrm{z}[\frac{1}{n(n+1)}]$

9.Find $\mathrm{Z}(a^n)$

10. Find the z-transform of $\mathrm{n}^2$

## PART-B

1. Find $Z[\cos n\,\theta]$ and $Z[\sin n\,\theta]$.

2. Find the Z transform of $\frac{1}{n(n+1)}\ for\ n \geq 1$

3. Find the inverse Z transform of $\frac{z^2+z}{(z-1)(z^2+1)}$, using Partial fraction

4. Using Z-transform, Solve $\mathrm{u_{n+2}} - 3\mathrm{u_{n+1}} + 2\mathrm{u_n} = 0$ given $\mathrm{u_0} = 0, \mathrm{u_1} = 1$

5. Using Convolution theorem find the inverse Z-transform of $\frac{z^2}{(z-\frac{1}{2})(z-\frac{1}{4})}$

6. Solve the difference equation x(n+2) – 3x(n+1) + 2x(n) = 0 given that x(0) = 0, x(1) = 1

7. Using Residue method,Find $Z^{-1}\left[\frac{\mathrm{z}}{\mathrm{z}^2-\mathrm{z}+2}\right]$

8. Find $Z[r^n \cos n\,\theta]$ and $Z^{-1}[(1-az^{-1})^{-2}]$

9. If U(z)= $Z^{-1}\left[\frac{z^3+z)}{(z-1)^3}\right]$ find the value of $u_0\,, u_1\ and\ u_2$

10.Using convolution theorem to evaluate $Z^{-1}\left[\frac{\mathrm{z}^2}{(\mathrm{z}-3)(\mathrm{z}-4)}\right]$

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**K.L.N. College of Engineering**

**Department of Electrical and Electronics Engineering**

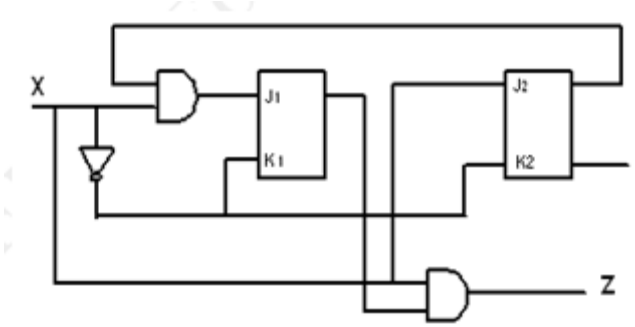
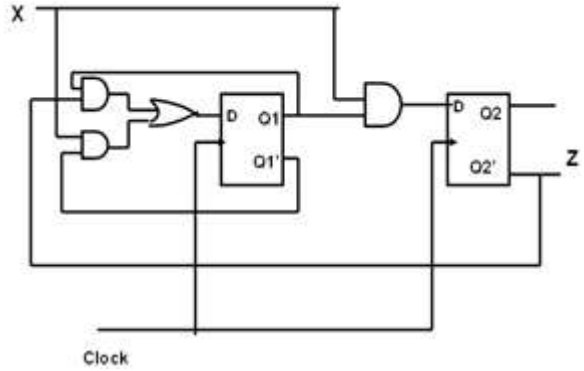
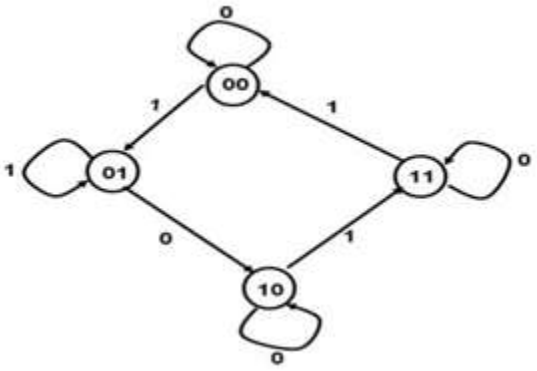
**EE6301 – DIGITAL LOGIC CIRCUITS [C202]**

**Important Questions/Assignments/ Self-study Topics/Seminar topics.**

**IMPORTANT QUESTIONS:**

| S.No. | 4. Important Questions. | COs | POs |
|---|---|---|---|
| Q.1.1. | Convert following hexadecimal number to decimal number.(a)F2816 (b) BC216 | C202.1 | 1 |
| Q.1.2. | Convert following decimal number to hexadecimal.(a)1259(b)5768<br>Give the Gray code for the binary number (111)2. | C202.1 | 1 |
| Q.1.3. | Convert (a)10010011101011012 (b)10010001011.001011102 to hexadecimal | C202.1 | 1 |
| Q.1.4. | Convert 35768 to hexadecimal | C202.1 | 1 |
| Q.1.5. | What weight does the digit 5 have in each of the following decimal number?(a)1530 (b)1.059(c)3258(d)567. | C202.1 | 1 |
| Q.1.6. | (i)Define noise margin.<br>(ii)Define Fan-out?<br>(iii)Define power dissipation?<br>(iv)What is propagation delay?<br>(v)Define fan in? | C202.1 | 1,2 |
| Q.1.7. | Draw the circuit diagram and explain the working of TTL inverter with tristate output | C202.1 | 1 |
| Q.1.8. | Draw and explain the circuit diagram of an ECL OR / NOR gate | C202.1 | 1 |
| Q.1.9. | Write short notes on TTL, ECL and CMOS digital logic families | C202.1 | 1 |
| Q.1.10 | Explain the working of 3 input totem pole TTL NAND gate | C202.1 | 1 |
| Q.1.11 | Discuss about TTL parameters | C202.1 | 1 |
| Q.1.12. | When can RTL be used to represent digital systems? | C202.1 | 1 |
| Q.1.13. | Explain the characteristics and implementation of the following digital logic families.<br>iCMOS, ii. ECL | C202.1 | 1 |
| Q.1.14. | Draw the internal circuits of TTL inverter and AND gate | C202.1 | 1 |
| Q.1.15. | Draw the TTL inverter circuit | C202.1 | 1 |
| Q.1.16. | (i) Explain the operation of TTL NAND gate with a neat circuit diagram.<br>ii) Draw the circuit of CMOS NOR gate and explain its operation. Any two advantages of CMOS over the other digital logic | C202.1 | 1 |
| Q.1.17. | Explain the concept and implementation of ECL logic family | C202.1 | 1 |
| Q.1.18 | Explain about error detection and correction codes | C202.1 | 1 |
| Q.1.19. | List the advantages of ECL as compared to TTL logic family | C202.1 | 1 |
| Q.1.20. | Explain the classifications of binary codes. | C202.1 | 1 |
| Q.2.1. | Using K-map simplify the expression Y (A, B, C, D) = $m_1+m_3+m_5+ m_7+m_8+m_9+ m_0+m_2+m_{10}+m_{12}+m_{13}$. Indicate the prime implicants, essential and non-essential prime implicants. Realize the logic circuit using AND-OR-INVERT gates and also by using NAN gates. | C202.2 | 1 |
| Q.2.2. | Design an 8421 to gray code converter | C202.2 | 1 |
| Q.2.3. | Simplify using five variable mapping F =(8,9,10,11,13,15,16,18,21,24,25,26,27,30,31) | C202.2 | 1 |
| Q.2.4. | Simplify the following function using K – map and tabular methods. Compare the methods.F ( A,B,C,D) = Σm(4,5,6,7,8) + Σd (11,12,13,14,15).Implement the result using NAND gates | C202.2 | 1 |
| Q.2.5. | i.Design a 4 bit BCD to Excess- 3 code converter.<br>ii.Design a two – bit magnitude Comparator | C202.2 | 1 |
| Q.2.6. | Reduce the Boolean function using k-map technique and implement using gates f (w, x, y, z)= Σm (0,1,4,8,9,10) which has the don't cares condition d (w, x, y, z)= Σm(2,11). | C202.2 | 1 |

<table>
<tr><td>Q.2.7.</td><td>i.Using 8 to 1 multiplexer, realize the following Boolean function<br>T = f (w,x,y,z) = Σ (1,1,2,4,5,7,8,9,12,13)<br>(ii)Design a logic circuit to simulate the function f (A, B, C) = A (B + C) by using only NAND gates.</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.8.</td><td>(a)Design an 8421 to gray code converter. (b)Implement the Boolean function using 8:1 mux F (A, B, C, D) =A’BD’+ACD+B’CD+A’C’D.</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.9.</td><td>Simplify the following Boolean function by using K-map method F (w, x, y, z) =∑m (0, 1, 2, 8, 10, 11, 14, 15)</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.10.</td><td>A combinational circuit is defined by the following three Boolean functions<br>F1 = x’y’z’+xz F2= xy’z’+x’y F3= x’y’z+xy. Design the circuit with a decoder and external gates</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.11.</td><td>Design A Full Adder And A Full Subtractor</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.12.</td><td>Design a 4-bit binary to excess-3 converter using the unused combinations of the code as don’t care conditions. Represent the converter using logic diagram</td><td>C202.2</td><td>1,2</td></tr>
<tr><td>Q.2.13.</td><td>Implement the following function with a Multiplexer f (a, b, c, d) = Σ ( 0, 1, 3, 4, 8, 9, 15)</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.14.</td><td>Simplify the following Boolean functions by using K’Map in SOP & POS F (w, x, y, z) = ∑m (1, 3, 4, 6, 9, 11, 12, 14)</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.15.</td><td>Obtain the minimum SOP using K-map method<br>F=m0+m2+m4+m8+m9+m10+m11+m12+m13</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.2.16.</td><td>Reduce the following using K-map method F=m2+m3+m4+m6+m7+m9+m11+m13</td><td>C202.2</td><td>1</td></tr>
<tr><td>Q.3.1.</td><td>A sequential circuit has 2D ff’s A and B an input x and output y is specified by the following next state and output equations.<br>a. A (t+1)= Ax + Bx<br>b. B (t+1)= A’x<br>c. Y= (A+B) x’<br>(i)Draw the logic diagram of the circuit ii. Derive the state table iii.Derive the state diagram.</td><td>C202.3</td><td>1</td></tr>
<tr><td>Q.3.2.</td><td>Design a mod-10 synchronous counter using Jk ff. write excitation table and state table.</td><td>C202.3</td><td>1</td></tr>
<tr><td>Q.3.3.</td><td>Design a sequential circuit using JK flip-flop for the following state table [use state diagram]<br><table><tr><th>Present state</th><th colspan="2">Next state</th><th colspan="2">Output</th></tr><tr><th>AB</th><th>X=0</th><th>X=1</th><th>X=0</th><th>X=1</th></tr><tr><td>00</td><td>00</td><td>11</td><td>1</td><td>0</td></tr><tr><td>01</td><td>01</td><td>11</td><td>1</td><td>1</td></tr><tr><td>10</td><td>01</td><td>00</td><td>1</td><td>0</td></tr><tr><td>11</td><td>11</td><td>10</td><td>0</td><td>0</td></tr></table></td><td>C202.3</td><td>1</td></tr>
<tr><td>Q.3.4.</td><td>Using SR flip-flops, design a synchronous counter which counts in the sequence 000, 111, 101, 110, 001, 010, 000,</td><td>C202.3</td><td>1</td></tr>
<tr><td>Q.3.5.</td><td>Design a synchronous counter using JK flip-flop to count the following sequence7, 4, 3, 1, 5, 0, 7</td><td>C202.3</td><td>1</td></tr>
<tr><td>Q.3.6.</td><td>Reduce the number of states in the following state table and tabulate the reduced state table.<br><table><tr><td rowspan="2">Present state</td><td colspan="2">Next State</td><td colspan="2">Output</td></tr><tr><td>x = 0</td><td>x = 1</td><td>x = 0</td><td>x = 1</td></tr><tr><td>a</td><td>F</td><td>b</td><td>0</td><td>0</td></tr><tr><td>b</td><td>D</td><td>c</td><td>0</td><td>0</td></tr><tr><td>c</td><td>F</td><td>e</td><td>0</td><td>0</td></tr><tr><td>d</td><td>G</td><td>a</td><td>1</td><td>0</td></tr></table></td><td>C202.3</td><td>1</td></tr>
</table>

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | e | D | c | 0 | 0 | | |
| | | f | F | b | 1 | 1 | | |
| | | g | G | h | 0 | 1 | | |
| | | h | G | a | 1 | 0 | | |
| Q.3.7. | A sequential circuit has four flip-flops ABCD and an input x is describe the following State equations.A (t + 1) = (CD' + C'D) x + (CD + C'D') x', B (t + 1) = A, C (t + 1) = B, D (t + 1) = C<br>a. Obtain the sequence of states when x = 1 starting from ABCD = 0001<br>b. Obtain the sequence of states when x = 0 starting from ABCD = 0000 | | | | | | C202.3 | 1 |
| Q.3.8. | Consider the following synchronous sequential circuit. Determine its state table.What does the circuit do?<br>  | | | | | | C202.3 | 1 |
| Q.3.9. | For the given Moore model sequential circuit, find the state table, state diagram, flips flop input and output equations.<br>  | | | | | | C202.3 | 1 |
| Q.3.10. | A sequential circuit with 2 D flip-flops A and B and input X and output Y is specified by the following next state and output equations. A (t + 1) = AX + BX, B (t + 1) = A'X, Y = (A + B) X'<br>(i)Draw the logic diagram of the circuit ii. Derive the state table iii.Derive the state diagram | | | | | | C202.3 | 1 |
| Q.3.11. | Design a synchronous decade counter using D flip flop. | | | | | | C202.3 | 1 |
| Q.3.12. | Design the clocked sequential circuit using JK flip-flops whose state diagram is given below<br>  | | | | | | C202.3 | 1 |
| Q.4.1. | Design an asynchronous sequential circuit that has two inputs X2 and X1 and one output | | | | | | C202.4 | 1 |

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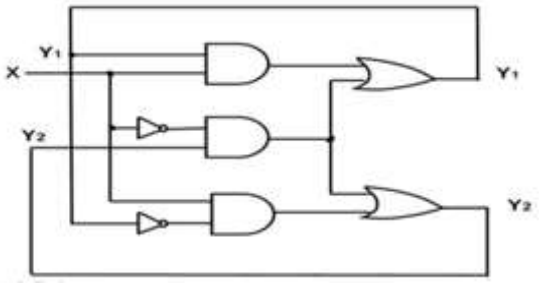
|---|---|---|---|
| | Z. The output is to remain a 0 as long as $X_1$ is a 0. The first change in $X_2$ that occurs while $X_1$ is a 1 will cause a Z to be a 1. Z is to remain a 1 until $X_1$ returns to 0. Construct a state diagram and flow table. Determine the output equations | | |
| Q.4.2. | An asynchronous sequential circuit has two internal states and one output. The excitation and output functions describing the circuit<br>$Y_1=x_1 + x_1y_2' + x_2y_1$ $Y_2=x_2 + x_1y_1' y_2 + x_1y_1$ $Z= x_2+y_1$<br>(i)Draw the logic diagram of the circuit. (ii) Derive the transition table and output map. (iii)Obtain a flow table for the circuit. | C202.4 | 1 |
| Q.4.3. | An asynchronous sequential circuit is described by the excitation and output functions<br>$Y = x_1x_2' + (x_1+x_2' ) y$& $Z = y$<br>(i)Draw the logic diagram of the circuit (ii) Derive the transition table and output map (iii)Obtain a two-state flow table. | C202.4 | 1 |
| Q.4.4. | Define the following: i) asynchronous sequential circuits, ii) Cycles, iii) critical and non-critical race | C202.4 | 1 |
| Q.4.5. | Draw the state diagram and obtain the primitive flow table for a circuit with two inputs $x_1$ and $x_2$ and two outputs $z_1$ and $z_2$ that satisfies the following conditions. When $x_1 x_2 = 00$ output $z_1$ $z_2 = 00$,when $x_1= 1$ and $x_2$ changes from 0 to 1 the output $z_1$ $z_2 = 01$, when $x_2= 1$ and $x_1$ changes from 0 to 1 the output $z_1$ $z_2 = 10$ otherwise output does not change | C202.4 | 1 |
| Q.4.6. | Draw a neat sketch showing the implementation of<br>$Z1 = ab'd'e + a'b'c'd'e' + bc + de$ , $Z2 = a'c'e$, $Z3 = bc + de + c'd'e' + bd$<br>$Z4 = a'c'e + ce$ using a 5 x 8 x 4 PLA. | C202.4 | 1 |
| Q.4.7. | Draw a PLA circuit to implement the logic functions A'BC + AB'C + AC' and A'B'C' + BC | C202.4 | 1 |
| Q.4.8. | Analyze the Boolean expression, K- Map, transition and state table and primitive flow table of the following asynchronous sequential circuits<br>  | C202.4 | 1 |
| Q.4.9. | Using ROM, design a combinational circuit which accepts 3 bit number and generates an output binary number equivalent to the square of input number. | C202.4 | 1 |
| Q.4.10. | Discuss the working of the following programmable logic devices: i. PROM ii. PLA iii.PAL | C202.4 | 1 |
| Q.4.11. | Illustrate the ROM and PLA design for the following functions W(A,B,C,D) = $\Sigma m(3,7,8,9,11,15)$ X(A,B,C,D) = $\Sigma m(3,4,5,7,10,14,15)$ Y (A, B, C, D) = $\Sigma m$ (1, 5, 7, 11, 15) | C202.4 | 1 |
| Q.4.12. | A combinational circuit is defined by the functions $F_1$ (A, B, C) = □m (3, 5, 6, 7), $F_2$ (A, B, C) = □m (0, 2, 4, 7). Implement the circuit using PLA. | C202.4 | 1 |
| Q.4.13. | Generate the following Boolean functions with a PAL with 4 inputs and 4 outputs.<br>$Y3 = A'BC'D + A'BCD' + A'BCD + ABC'D$<br>$Y2 = A'BCD' + A"BCD + ABCD$<br>$Y1 = A'BC' + A'BC + AB'C + ABC'$<br>$Y0 = ABCD$ | C202.4 | 1 |
| Q.5.1. | Write a HDL code for state machine to BCD to ex–3 codes Converter. | C202.5 | 1 |
| Q.5.2. | Write the HDL gate level description of the priority encoder | C202.5 | 1 |

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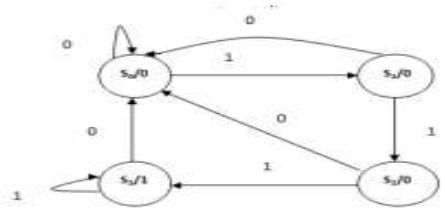
| Q.5.3. | Write a behavioral VHDL description of the 4 bit counter | C202.5 | 1 |
| Q.5.4. | Write a HDL code for 8:1 MUX using behavioral model | C202.5 | 1 |
| Q.5.5. | Write an HDL data flow description of a 4 bit adder subtractor of Unsigned numbers use the conditional operator | C202.5 | 1 |
| Q.5.6. | Write a HDL code for RTL Design | C202.5 | 1 |
| Q.5.7. | Write VHDL code for a full sub tractor using logic Equation | C202.5 | 1,2 |
| Q.5.8. | Write a VHDL description of an S-R latch. | C202.5 | 1 |
| Q.5.9. | Write a HDL code for mod 6 counter | C202.5 | 1 |
| Q.5.10. | Write a HDL code for BCD to 7-segment display decoder | C202.5 | 1 |
| Q.5.11. | Write the HDL description of the circuit specified by the Following Boolean equations S = xy '+ x'y , C=xy | C202.5 | 1 |
| | **5. Assignments / Seminar / Self-study topics.** | | |
| A.1.1. | Perform the following addition using BCD and Excess – 3 addition (205+569). | C202.1 | 1,2 |
| A.1.2. | (i)Encode the binary word 1011 into seven bit even parity Hamming code.<br>ii) Explain Hamming code with an example. State its advantages over parity codes. | C202.1 | 1 |
| A.1.3. | Explain the working of a 3 input TTL totem pole NAND gate. | C202.1 | 1,2,3 |
| A.1.4. | i) Subtract a) X-Y and b) Y-X using 2's complement method X=10101 Y=1001<br>ii) Subtract a) X-Y and b) Y-X using 9's complement method X=8245 Y=1342 | C202.1 | 1,2 |
| A.1.5. | i)Explain the working of CMOS NOR gate.<br>ii) Explain the working of open collector TTL NAND gate. | C202.1 | 1,2 |
| A.2.1. | i) Explain how a full adder can be designed using 2 half adders and a OR gate<br>ii) Design a binary to gray code converter | C202.2 | 1,2 |
| A.2.2. | i) Design a logic circuit to simulate the function f(A,B,C)=A(B+C) by using only NAND gates<br>ii) Explain the with truth table and gate level circuits diagram for a full subtractor | C202.2 | 1,2 |
| A.2.3. | Express the following function as the minimal sum of products & product of sums, using a K map F(a,b,c,d)=Σm(0,2,4,5,6,8,10,15) + Σd(7,13,14) | C202.2 | 1,2 |
| A.2.4. | i) Design a BCD to Excess 3 code converter<br>ii) Implement the following Boolean function using 8:1 MUX F(A,B,C,D) = Σm(0,1,3,4,8,9,15) | C202.2 | 1,2 |
| A.2.5. | Obtain the minimal SOP using form for the following 5 variable switching function using K map: f= Σm(2,3,6,7,11,12,13,14,15,23,28,29,30,31)+ Σd(16,27) | C202.2 | 1,2 |
| A.3.1. | Design a MOD-10 synchronous counter using JK flip-flops. Write excitation table and state table. | C202.3 | 1,2 |
| A.3.2. | Design a 4 bit up-down counter using JK flipflops and explain its function with timing diagrams. | C202.3 | 1,2 |
| A.3.3. | i) Explain in detail about serial in serial out shift register.<br>ii) Explain the operation of JK master slave flip-flop. State its advantage. | C202.3 | 1,2 |
| A.3.4. | Design a sequence detector to detect the sequence 101 using JK flip flop. | C202.3 | 1,2 |
| A.3.5. | Design a synchronous sequential circuit using JK for the given state diagram  | C202.3 | 1,2 |
| | **TUTORIALS** | | |
| T.1.1 | (i)Convert following hexadecimal number to decimal number.(a)F2816 (b) BC216<br>(ii)Convert following decimal number to hexadecimal.(a)1259(b)5768 | C202.1 | 1,2 |

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|---|---|---|---|
| T.1.2 | What weight does the digit 5 have in each of the following decimal number?(a)1530 (b)1.059(c)3258(d)567. | C202.1 | 1,2 |
| T.1.3 | (i)Convert (a) 10010011101011012 (b) 10010001011.001011102 to hexadecimal.<br>(ii)Convert 35768 to hexadecimal | C202.1 | 1,2 |
| T.1.4 | Given that a frame with bit sequence 1101011011 is transmitted, it has been received as 1101011010. Determine the method of detecting the error using any one detecting code. | C202.1 | 1,2 |
| T.1.5 | (i)Draw the MOS logic circuit for NOT gate and explain its operation<br>(ii) Design a TTL logic circuit for a 3-input NAND gate | C202.1 | 1,2 |
| T.2.1 | (i)Prove that ABC + ABC' + AB'C + A'BC = AB + AC + BC<br>(ii)Simplify the following expression Y = (A + B) (A + C') (B' + C') | C202.2 | 1,2 |
| T.2.2 | Find the complement of the functions F1 = x'yz' + x'y'z and F2 = x (y'z' + yz). By applying De- Morgan's theorem. | C202.2 | 1,2 |
| T.2.3 | Given F= B'+ A'B + A'C'. Identify the redundant term using K-Map. | C202.2 | 1,2 |
| T.2.4 | Simplify the following Boolean functions by using K'Map in SOP & POS. F (w, x, y, z) = ∑m (1, 3, 4, 6, 9, 11, 12, 14) | C202.2 | 1,2 |
| T.2.5 | Reduce the Boolean function using k-map technique and implement using gates f (w, x, y, z)= Σm (0,1,4,8,9,10) which has the don't cares condition d (w, x, y, z)= Σm(2,11). | C202.2 | 1,2 |
| T.2.6 | Design an 8421 to gray code converter. | C202.2 | 1,2 |
| T.2.7 | Implement the Boolean function using 8:1 mux F (A, B, C, D) =A'BD'+ACD+B'CD+A'C'D. | C202.2 | 1,2 |
| T.3.1 | A sequential circuit has 2D ff's A and B an input x and output y is specified by the following next state and output equations.<br>A (t+1)= Ax + Bx ,B (t+1)= A'x ,Y= (A+B) x'<br>(i)Draw the logic diagram of the circuit.(ii)Derive the state table.(iii)Derive the state diagram. | C202.3 | 1,2 |
| T.3.2 | Design a mod-6 synchronous counter using Jk ff. write excitation table and state table. | C202.3 | 1,2 |
| T.3.3 | (a) Write the excitation tables of SR, JK, D, and T Flip flops<br>(b) Realize D and T flip flops using Jk flip flops | C202.3 | 1,2 |
| T.3.4 | Design a sequential detector which produces an output 1 every time the input sequence 1011isdetected. | C202.3 | 1,2 |
| T.3.5 | Design a counter with the following repeated binary sequence:0, 1, 2, 3, 4, 5, 6.use JK Flip flop. | C202.3 | 1,2 |
| T.3.6 | Using positive edge triggering SR flip-flops design a counter which counts in the following sequence: 000,111,110,101,100,011,010,001,000,… | C202.3 | 1,2 |
| T.4.1 | 7. Implement the following function using PLA.<br>a. A (x,y, z) = ∑m (1, 2, 4, 6)<br>b. B (x, y, z) = ∑m (0, 1, 6, 7)<br>c. C (x, y, z) = ∑m (2, 6) | C202.4 | 1,2 |
| T.4.2 | 8. Implement the following function using PAL.<br>a. W (A, B, C, D) = ∑m (2, 12, 13)<br>b. X (A, B, C, D) = ∑m (7, 8, 9, 10, 11, 12, 13, 14, 15)<br>c. Y (A, B, C, D) = ∑m (0, 2, 3, 4, 5, 6, 7, 8, 10, 11, 15)<br>d. Z (A, B, C, D) = ∑m (1, 2, 8, 12, 13) | C202.4 | 1,2 |
| T.4.3 | (i) A combinational circuit is defined by the functions.<br>a. F1 (a, b, c) = ∑ m (3, 5, 6, 7)<br>b. F2 (a, b, c) = ∑ m (0, 2, 4, 7)Implement the circuit with a PLA. | C202.4 | 1,2 |
| T.4.4 | Analyze the Boolean expression, K- Map, transition and state table and primitive flow table of the following asynchronous sequential circuits | C202.4 | 1,2 |

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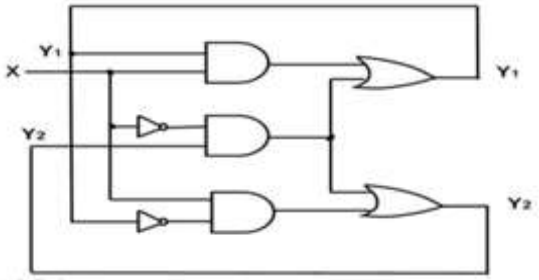
|---|---|---|---|
| |  | | |
| T.4.5 | An asynchronous sequential circuit has two internal states and one output. The excitation and output functions describing the circuit<br>Y1=x1 +x1y2' +x2y1 Y2=x2 +x1y1' y2+x1y1 Z= x2+y1<br>Draw the logic diagram of the circuit.(6)<br>Derive the transition table and output map.(5)<br>Obtain a flow table for the circuit.(5) | C202.4 | 1,2 |
| T.4.6 | An asynchronous sequential circuit is described by the excitation and output functions<br>Y = x1x2' +(x1+x2' ) y& Z =y<br>Draw the logic diagram of the circuit .<br>Derive the transition table and output map<br>Obtain a two-state flow table. | C202.4 | 1,2 |
| T.5.1 | Write a HDL program module for full adder circuit. | C202.5 | 1,2 |
| T.5.2 | Write a HDL code for 8:1 MUX using behavioral model | C202.5 | 1,2 |
| T.5.3 | Write an HDL behavioral description of ripple counter | C202.5 | 1,2 |
| T.5.4 | Write a HDL program for four bit ripple carry adder. | C202.5 | 1,2 |
| **5. Assignments / <u>Seminar</u> / Self-study topics.** | | | |
| Sem.1. | Pulse and Digital Circuits | C202. | |
| Sem.2. | FPAA for Analog Circuit Design | C202. | |
| Sem.3. | Digital Circuits Logic Design | C202. | |
| Sem.4. | Digital Logic for Medicine | C202. | |
| Sem.5. | Digital Logic for Biology Research | C202. | |
| Sem.6. | Memristor | C202. | |
| Sem.7. | Embryonics Approach Towards Integrated Circuits | C202. | |
| Sem.8. | An Introduction to Low Power Design in VLSI | C202. | |
| Sem.9. | Complex Programmable Logic Device | C202. | |
| Sel.1. | VHDL Modelling of Glue Logic of 1553b Interface Board | C202. | |
| Sel.2. | FPGA for Digital Circuits | C202. | |

**K.L.N. College of Engineering**

**Department of Electrical and Electronics Engineering**

**EE6302- ELECTROMAGNETIC THEORY [C203]**

**Important Questions /Tutorials /Assignments /Self-study /Seminar topics.**

| S.No. | 1. Questions. | COs | POs |
|---|---|---|---|
| Q.1.1 | Given that $\bar{\mathbf{D}} = \frac{10}{3}\mathbf{x^3}\,\bar{\mathbf{a}}_x$ c/m$^2$ , evaluate both sides of the divergence theorem for the volume of a cube, 2 m on the edge, centered at the origin and with edges parallel to the axis? | C203.1 | 1,2 |
| Q.1.2 | A vector field $\bar{\mathbf{D}} = \frac{5}{4}\mathbf{r^2}\bar{\mathbf{a}}_r$ is given in spherical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed by r=4 m & $\theta = \pi/4$. | C203.1 | 1,2 |
| Q.1.3 | A vector field $\bar{\mathbf{D}} = \frac{5}{4}\mathbf{r^2}\bar{\mathbf{a}}_r$ is given in spherical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed between r = 1m & r = 2m. | C203.1 | 1,2 |
| Q.1.4 | Given $\bar{\mathbf{A}} = \mathbf{2r\cos\varphi}\,\bar{\mathbf{a}}_r + \mathbf{r}\,\bar{\mathbf{a}}_\varphi$ in cylindrical co-ordinates. for the contour x=0 to 1, y=0 to1, verify stoke's theorem | C203.1 | 1,2 |
| Q.1.5 | Verify the divergence theorem for the following case $\bar{\mathbf{A}} = \mathbf{xy^2}\bar{\mathbf{a}}_x + \mathbf{y^3}\,\bar{\mathbf{a}}_y + \mathbf{y^2z}\,\bar{\mathbf{a}}_z$ and the surface is a cuboids defined by 0 < x < 1, 0 < y < 1 and 0 < z < 1 | C203.1 | 1,2 |
| Q.1.6 | Check validity of the divergence theorem considering the field $\bar{\mathbf{D}} = \mathbf{2xy}\,\bar{\mathbf{a}}_x + \mathbf{x^2}\,\bar{\mathbf{a}}_y$ c/m$^2$ and the rectangular parallelepiped formed by the planes x = 0, x = 1, y = 0,y = 2 & z = 0, z = 3. | C203.1 | 1,2 |
| Q.1.7 | Determine the divergence and curl of these vectors fields<br>$\bar{\boldsymbol{P}} = \boldsymbol{x^2yz}\,\bar{\mathbf{a}}_x + \mathbf{xz}\,\bar{\mathbf{a}}_z$<br>$\bar{\mathbf{Q}} = \boldsymbol{\rho}\sin\boldsymbol{\varphi}\;\bar{\mathbf{a}}_\rho + \boldsymbol{\rho^2 z}\,\bar{\mathbf{a}}_\varphi + \mathbf{z}\cos\boldsymbol{\varphi}\;\bar{\mathbf{a}}_z$,<br>$\bar{\boldsymbol{T}} = \frac{1}{r^2}\cos\theta\;\bar{\mathbf{a}}_r + \mathbf{r}\sin\theta\cos\varphi\;\bar{\mathbf{a}}_\theta + \cos\varphi\;\bar{\mathbf{a}}_\varphi$ | C203.1 | 1,2 |
| Q.1.8 | If a Scalar potential is given by the expression $\boldsymbol{\varphi} = \mathbf{xyz}$, determine the potential gradient and also prove that the vector $\bar{\mathbf{F}} = \mathbf{grad}\ \varphi$ is irrotational. Find the gradient of the following scalar fields:<br>(i) $\boldsymbol{V = e^{-z}\sin 2x\cosh y}$ **(ii)** $U = \boldsymbol{\rho^2 z\cos 2\varphi}$ (iii) $\boldsymbol{W = 10\,r\,\sin^2\theta\,cos\varphi}$ | C203.1 | 1,2 |
| Q.1.9 | Using gauss's law, calculate the **E** due to infinitely large uniformly charged plate? And two such plates- are placed parallel to each other. Compute **E** between and outside the plates when both the plates are -charged with the same charge density? | C203.1 | 1,2 |
| Q.1.10 | A Line charge of 20nC/m is located at x = 2m and y = - 4m. Calculate the field E at (-2, -1, 4) m. | C203.1 | 1,2 |
| Q.1.11 | A circular disc of radius 'a' m is charged uniformly with a charge density of σ c/ m$^2$. find the electric field at a point 'h' m from the disc along its axis | C203.1 | 1,2 |
| Q.1.12 | Derive an expression for electric field intensity **E** due to a uniformly charged long Straight line with constant charge density in C/m? | C203.1 | 1,2 |
| Q.1.13 | Three surface charge distributions are located in free space as follows: **10 μ C/m$^2$** at x **= 2, - 20 μC/m$^2$** at **y= - 3** and **30 μC/m$^2$** at **z = 5**. Determine **E** at **P (5,-1, 4)?** | C203.1 | 1,2 |
| Q.1.14 | Derive Electric field intensity and electric flux density for infinite line charge and infinite sheet of charge using gauss's law? | C203.1 | 1,2 |
| Q.1.15 | Given **E** = y $\mathbf{a}_x$ – x $\mathbf{a}_y$ + 2 $\mathbf{a}_z$ **,** determine work expended in carrying 2C from B (1, 0, 1) to A(0.8, 0.6, 1) along shorter arc of circle and determine work required to carry 2C from B to A along straight line path from B to A? | C203.1 | 1,2 |
| Q.2.1 | Determine the capacitance of capacitor consisting of two parallel metal plates 30cm x 30cm, surface area, separated by 5 mm in air. What is the total energy stored by the capacitor if the capacitor is charged to P.D. of 500 V? What is the energy density? | C203.2 | 1,2 |
| Q.2.2 | A parallel plate capacitor with a separation of 1 cm has 29 kV applied, when air was the dielectric used. Assume that the dielectric strength of air as 30 kV/cm. A thin piece of glass with $\varepsilon_r$ = 6.5 with a dielectric strength of 290 kV/cm with thickness 0.2 cm is inserted. Find whether glass or air will break? | C203.2 | 1,2 |
| Q.2.3 | Find the total current in a circular conductor of radius 4 mm, if the current density varies according to $J = \frac{10^4}{r}$ (A/m$^2$) | C203.2 | 1,2 |
| Q.3.1 | Plane y =0 carries a uniform current of 30 $\boldsymbol{\bar{a}_z\,mA/m}$. Calculate the magnetic field intensity | C203.3 | 1,2 |

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| | at (1, 10, -2) m in rectangular co –ordinate system. | | |
| Q.3.2 | Find the force for a wire is perpendicular to the page with current flowing inward has producing a Magnetic field B. | C203.3 | 1,2 |
| Q.3.3 | Find the magnetic flux density at a point on the axis of a loop of radius 'b' that carries a direct current I. | C203.3 | 1,2 |
| Q.3.4 | A thin cylindrical conductor of radius 'a' infinite in length carries a current I. Find H at all points? | C203.3 | 1,2 |
| Q.3.5 | Find $\bar{\boldsymbol{H}}$ at the centre of an equilateral triangle loop of side 4 m carrying current of 5A? | C203.3 | 1,2 |
| Q.3.6 | An iron ring with a cross sectional area of 3 $cm^2$ and a mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3 A. The relative permeability of the ring is 1500. Calculate the flux established in the ring. | C203.3 | 1,2 |
| Q.3.7 | Determine the force between two long parallel wires of 200 m length separated by 5 cm in air and carrying currents of 40 A in same direction and in opposite direction. | C203.3 | 1,2 |
| Q.3.8 | Two coils when connected in series aiding have a total inductance of 860 mH and when connected in series opposing the total inductance is 140 mH. One coil has 4 times the inductance of the other. Calculate the inductance of each coil, the mutual inductance and co-efficient of coupling. | C203.3 | 1,2 |
| Q.3.9 | A magnetic material has $\mu_r = 10/\pi$ and is in a magnetic field of strength $\bar{\boldsymbol{H}} = \mathbf{5}\boldsymbol{\rho}^{\mathbf{3}}\bar{\boldsymbol{a}}_{\boldsymbol{\varphi}}\ \boldsymbol{A/m}$. Find the magnetization | C203.3 | 1,2 |
| Q.3.10 | A solenoid has 400 turns with a length of 2 m. It has a circular cross section of 0.1 $m^2$ . Find its inductance. | C203.3 | 1,2 |
| Q.3.11 | Consider a co-axial cable with inner conductor radius 'a' carrying current I, while – I is uniformly distributed in the outer conductor. The outer conductor is in the form of concentric cylinder whose inner radius is 'b' and outer radius is 'c'. Obtain the expression for magnetic field intensity $\bar{\boldsymbol{H}}$ for the following regions, applying Amperes law (a) region r < a (b) region between 'a' and 'b' (i.e. a < r < b) (c) region between b and c and (d) region r > c. | C203.3 | 1,2 |
| Q.4.1 | Explain the different methods of emf induction with necessary governing equation with suitable examples? | C203.4 | 1,2 |
| Q.4.2 | Derive from first principles, Maxwell's equation for electric and magnetic field in both differential and integral form? | C203.4 | 1,2 |
| Q.4.3 | Derive the relationship between circuit theory and field theory using RLC circuit? | C203.4 | 1,2 |
| Q.5.1 | Determine the skin depth of copper at 60Hz with $\sigma = 5.8 \times 10^7$ S/m. Given $\mu_r = 1$; | C203.5 | 1,2 |
| Q.5.2 | A plane wave propagating through a medium with $\mu_r = 2$, $\varepsilon_r = 8$ has $E = 0.5 \sin(10^8 t - \beta z)\ \bar{\mathbf{a}}_x$ V/m. Determine the propagation parameters and H fields? | C203.5 | 1,2 |
| Q.5.3 | In free space E (z ,t) = 50 cos (ωt - βz) ax V/m. Find the average power crossing a circular area of radius 2.5 m in the constant Z- Plane. | C203.5 | 1,2 |
| Q.5.4 | Find the velocity of a plane wave in a loss-less medium having a relative permittivity of 5 and relative permeability of unity? | C203.5 | 1,2 |
| Q.5.5 | Derive the electromagnetic wave equation from the Maxwell's equation and their solution? | C203.5 | 1,2 |
| Q.5.6 | Give a mathematical representation of plane waves propagating in +Z direction in an infinite loss less dielectric medium. Explain how this medium is characterized by propagation constant and wave impedance? | C203.5 | 1,2 |
| Q.5.7 | Obtain the expression for Poynting vector from the Maxwell's equation for the general case? | C203.5 | 1,2 |
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| | **2. Assignments** | | |
| A1.1 | Prove that curl grad φ = 0; | C203.1 | 1,2 |
| A1.2 | Given the point **A (-2, 6, 3),** find the spherical coordinate of point A? | C203.1 | 1,2 |
| A1.3 | Given that $\bar{\mathbf{D}} = \frac{\mathbf{10}}{\mathbf{3}}\mathbf{x}^{\mathbf{3}}\ \bar{\mathbf{a}}_x$ c/$m^2$ , evaluate both sides of the divergence theorem for the volume of a cube, 2 m on the edge, centered at the origin and with edges parallel to the axis? | C203.1 | 1,2 |
| A1.4 | A vector field $\bar{\mathbf{D}} = \frac{\mathbf{5}}{\mathbf{4}}\mathbf{r}^{\mathbf{2}}\bar{\mathbf{a}}_r$ is given in spherical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed between r = 1m & r = 2m. | C203.1 | 1,2 |
| A1.5 | A Magnetic field $\bar{\mathbf{H}} = \mathbf{3}\ \cos \mathbf{x}\,\bar{\mathbf{a}}_x + \mathbf{z}\cos \mathbf{x}\ \bar{\mathbf{a}}_y$, A/m, for $\mathbf{z} \geq \mathbf{0}$ <br> $= \mathbf{0}$ for $\mathbf{z} < \mathbf{0}$ <br> is applied to a perfectly conducting surface in x y plane. Find the current density on the Conductor surface. | C203.1 | 1,2 |

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| A1.6 | If $\overline{\mathbf{G}(\mathbf{r})} = \mathbf{10e^{-2z}}(\boldsymbol{\rho}\,\bar{\mathbf{a}}_{\boldsymbol{\rho}} + \bar{\mathbf{a}}_{\mathbf{z}})$, determine the flux of G out of the surface of the cylinder ρ=1, 0 ≤ z ≤ 1. | C203.1 | 1,2 |
| A1.7 | Check validity of the divergence theorem considering the field $\bar{\mathbf{D}} = \mathbf{2xy}\,\bar{\mathbf{a}}_{\mathbf{x}} + \mathbf{x^2}\,\bar{\mathbf{a}}_{\mathbf{y}}$ c/m$^2$ and the rectangular parallelepiped formed by the planes x = 0, x = 1,y = 0,y = 2 & z = 0,z = 3. | C203.1 | 1,2 |
| A1.8 | If a Scalar potential is given by the expression $\boldsymbol{\varphi} = \mathbf{xyz}$, determine the potential gradient and also prove that the vector $\bar{\mathbf{F}} = \mathbf{grad}\ \varphi$ is irrotational. | C203.1 | 1,2 |
| A1.9 | Find the electric potential at a point **(4, 3) m** due to charge of $\mathbf{10^{-9}C}$ located at the origin in free space. | C203.1 | 1,2 |
| A1.10 | Using gauss's law, calculate the **E** due to infinitely large uniformly charged plate? And two such plates- are placed parallel to each other. Compute **E** between and outside the plates when both the plates are -charged with the same charge density? | C203.1 | 1,2 |
| A1.11 | Derive the expressions for potential due to a point charge and a ring charge? | C203.1 | 1,2 |
| A1.12 | Derive the electric field and potential distribution and the capacitance per unit length of a coaxial cable | C203.1 | 1,2 |
| B1.1 | A Line charge of 20nC/m is located at x = 2m and y = - 4m. Calculate the field E at (-2, -1, 4) m. | C203.1 | 1,2 |
| B1.2 | Derive an expression for electric field intensity **E** due to a uniformly charged long Straight line with constant charge density in C/m? | C203.1 | 1,2 |
| B1.3 | Derive Electric field intensity and electric flux density for infinite line charge and infinite sheet of charge using gauss's law? | C203.1 | 1,2 |
| B1.4 | Derive the electrostatic boundary conditions at the interface of two dielectric media. If one of the medium is conductor, discuss the field pattern | C203.2 | 1,2 |
| B1.5 | Conducting spherical shells with radii a = 10 cm, b= 30 cm are maintained at a potential difference of 100V such that at V =0 at r= b and V = 100 V at r=a. Determine V and E region between the shells. If $\varepsilon_r$ = 2.5 in the region, determine the total charge induced in the shells and the capacitance of the capacitor. | C203.2 | 1,2 |
| B1.6 | Calculate the total charge enclosed by a cube of 2m sides, centered at the origin and with the edges parallel to the axis when the electric flux density over the cube is $\mathbf{D}$=10x$^3$/3 $\mathbf{a_x}$ (c/m$^2$)? | C203.2 | 1,2 |
| B1.7 | Given $\bar{J} = 10^4 \sin\theta\, \bar{\boldsymbol{a}}_{\boldsymbol{r}}\, \boldsymbol{A/m^2}$ in spherical system. Find the current passing through spherical shell of r = 0.02 m. | C203.2 | 1,2 |
| B1.8 | Calculate inductance of ring shaped coil having a mean diameter of 20 cm wound on a wooden core of 2 cm diameter. The winding is uniformly distributed and contains 200 turns? | C203.3 | 1,2 |
| B1.9 | A conductor located at x = 0.5 m, y =0 and 0 < z < 2.0 m carries a current of 10 A in the $\bar{\boldsymbol{a}}_{\boldsymbol{z}}$ direction. Along the length of the conductor $\bar{\boldsymbol{B}} = 2.5\ \bar{\boldsymbol{a}}_{\boldsymbol{z}}\ \boldsymbol{T}$. find the torque about the x axis. | C203.3 | 1,2 |
| B1.10 | A solenoid 4 cm in length carries a current of 100 mA. If solenoid is to produce magnetic flux density of 5mWb/m$^2$, how many turn of wire are needed. | C203.3 | 1,2 |
| B1.11 | A long straight wire carries a current I = 1 A. At what distance is the magnetic field H= 1A/m. | C203.3 | 1,2 |
| B1.12 | Derive the Magnetostatic boundary conditions at the interface two different magnetic media? | C203.3 | 1,2 |
| C1.1 | Explain magnetization in magnetic materials and explain how the effect of magnetization is taken into account in the calculation of B/H? | C203.3 | 1,2 |
| C1.2 | Find the torque about the y axis for the two conductors of length l, carrying current in opposite directions, separated by fixed distance w, in the uniform magnetic field in x directions? | C203.3 | 1,2 |
| C1.3 | Derive an expression for magnetic scalar and vector potential. | C203.3 | 1,2 |
| C1.4 | Obtain the expression for Magnetic field strength at an 'r' m from conductor of finite length? | C203.3 | 1,2 |
| C1.5 | A circular loop located on x$^2$+y$^2$=9, z=0 carries a direct current of 10 A along $\bar{\boldsymbol{a}}_{\boldsymbol{\varphi}}$ direction in cylindrical coordinate system. Derive the expression for magnetic field intensity $\boldsymbol{d\bar{H}}$ at point *P*(0,0,h) contributed by current element $\mathbf{I}\,\boldsymbol{d\bar{l}}$ using Biot-savart's law. Determine $\bar{\boldsymbol{H}}$ at (0, 0, 4). | C203.3 | 1,2 |
| C1.6 | Calculate the inductance of 10 m length of a coaxial cable filled with a material for which $\varepsilon_R$ = 18, σ =0 and $\mu_R$ = 8 and having dimensions of a = 1mm and b= 4mm. | C203.3 | 1,2 |

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| C1.7 | Derive from first principles, Maxwell's equation for electric and magnetic field in both differential and integral form? | C203.4 | 1,2 |
| C1.8 | Derive the relationship between circuit theory and field theory using RLC circuit? | C203.4 | 1,2 |
| C1.9 | Explain the different methods of emf induction with necessary governing equation with suitable examples? | C203.4 | 1,2 |
| C1.10 | Derive the electromagnetic wave equation from the Maxwell's equation and their solution? | C203.5 | 1,2 |
| C1.11 | Give a mathematical representation of plane waves propagating in +*Z* direction in an infinite loss less dielectric medium. Explain how this medium is characterized by propagation constant and wave impedance? | C203.5 | 1,2 |
| C1.12 | Obtain the expression for Poynting vector from the Maxwell's equation for the general case? | C203.5 | 1,2 |
| | **3. Tutorials** | | |
| T.1.1 | Transform a vector $\bar{\mathbf{A}} = \mathbf{Y}\bar{\mathbf{a}}_x - \mathbf{X}\,\bar{\mathbf{a}}_y + \mathbf{Z}\,\bar{\mathbf{a}}_z$ in to cylindrical co-ordinates. | C203.1 | 1,2 |
| T.1.2 | Given that **P(-3,2,1)** and vector $\bar{\mathbf{A}} = \mathbf{y}\,\bar{\mathbf{a}}_x + (\mathbf{x}+\mathbf{z})\,\bar{\mathbf{a}}_y$ , express P and A in cylindrical Co-ordinate system | C203.1 | 1,2 |
| T.1.3 | Find the gradient of a scalar function of position f, where $\mathbf{F(x,y,z) = x^2y + e^z}$ at point **P (1,5,-2).** | C203.1 | 1,2 |
| T.1.4 | A vector field $\bar{\mathbf{D}} = \frac{5}{4}\mathbf{r}^2\bar{\mathbf{a}}_r$ is given in spherical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed by r=4 m & $\theta = \pi/4$. | C203.1 | 1,2 |
| T.1.5 | Given $\bar{\mathbf{A}} = \mathbf{2r\cos\varphi}\,\bar{\mathbf{a}}_r + \mathbf{r}\,\bar{\mathbf{a}}_\varphi$ in cylindrical co-ordinates. for the contour x=0 to 1,y=0 to1, verify stoke's theorem | C203.1 | 1,2 |
| T.1.6 | Verify the divergence theorem for the following case $\bar{\mathbf{A}} = \mathbf{xy^2}\bar{\mathbf{a}}_x + \mathbf{y^3}\,\bar{\mathbf{a}}_y + \mathbf{y^2z}\,\bar{\mathbf{a}}_z$ and the surface is a cuboids defined by 0 < x < 1, 0 < y < 1 and 0 < z < 1 | C203.1 | 1,2 |
| T.1.7 | Determine the divergence and curl of these vectors fields<br>$(i)\ \bar{\boldsymbol{P}} = \boldsymbol{x^2yz}\,\bar{\mathbf{a}}_x + \mathbf{xz}\,\bar{\mathbf{a}}_z$<br>$(ii)\ \bar{\mathbf{Q}} = \boldsymbol{\rho}\sin\boldsymbol{\varphi}\ \bar{\mathbf{a}}_\rho + \boldsymbol{\rho^2}\mathbf{z}\,\bar{\mathbf{a}}_\varphi + \mathbf{z}\cos\boldsymbol{\varphi}\ \bar{\mathbf{a}}_z$,<br>$(iii)\ \bar{\boldsymbol{T}} = \frac{1}{r^2}\cos\boldsymbol{\theta}\ \bar{\mathbf{a}}_r + \mathbf{r}\sin\boldsymbol{\theta}\cos\boldsymbol{\varphi}\ \bar{\mathbf{a}}_\theta + \cos\boldsymbol{\varphi}\ \bar{\mathbf{a}}_\varphi$ | C203.1 | 1,2 |
| T.1.8 | Find the gradient of the following scalar fields:<br>**(i)** $\boldsymbol{V = e^{-z}\sin 2x\cosh y}$<br>(ii) $\boldsymbol{U = \rho^2 z\cos 2\varphi}$<br>(iii) $\boldsymbol{W = 10\,r\,\sin^2\theta\cos\varphi}$ | C203.1 | 1,2 |
| T.1.9 | The electric potential near the origin of a system of coordinates is $\mathbf{V=ax^2+by^2+cz^2}$**.** Find the electric field at **(1, 2, 3)** | C203.1 | 1,2 |
| T.1.10 | Given $\mathbf{E} = y\,\mathbf{a}_x - x\,\mathbf{a}_y + 2\,\mathbf{a}_z$ **,** determine work expended in carrying 2C from B (1, 0, 1) to A(0.8, 0.6, 1) along shorter arc of circle and determine work required to carry 2C from B to A along straight line path from B to A? | C203.1 | 1,2 |
| T.2.1 | A circular disc of radius 'a' m is charged uniformly with a charge density of σ c/ $m^2$. find the electric field at a point 'h' m from the disc along its axis | C203.1 | 1,2 |
| T.2.2 | Three surface charge distributions are located in free space as follows: **10 μ C/$m^2$** at x = **2, - 20 μC/$m^2$** at **y= - 3** and **30 μC/$m^2$** at **z = 5**. Determine **E** at **P (5,-1, 4)?** | C203.1 | 1,2 |
| T.2.3 | A total charge of $\mathbf{10^{-8}}$ **C** is distributed uniformly along a ring of radius of **5m**. Calculate the Potential on the axis of the ring at apoint **5m** from the centre of the ring? | C203.1 | 1,2 |
| T.2.4 | Determine the capacitance of capacitor consisting of two parallel metal plates 30cm x 30cm, surface area, separated by 5 mm in air. What is the total energy stored by the capacitor if the capacitor is charged to P.D. of 500 V? What is the energy density? | C203.2 | 1,2 |
| T.2.5 | A parallel plate capacitor with a separation of 1 cm has 29 kV applied, when air was the dielectric used. Assume that the dielectric strength of air as 30 kV/cm. A thin piece of glass with $\varepsilon_r$ = 6.5 with a dielectric strength of 290 kV/cm with thickness 0.2 cm is inserted. Find whether glass or air will break? | C203.2 | 1,2 |
| T.3.1 | Plane y =0 carries a uniform current of 30 $\boldsymbol{\bar{a}_z\,mA/m}$. Calculate the magnetic field intensity at (1, 10, -2) m in rectangular co –ordinate system. | C203.3 | 1,2 |
| T.3.2 | Find the force for a wire is perpendicular to the page with current flowing inward has producing a Magnetic Field **B**. | C203.3 | 1,2 |
| T.3.3 | Find the magnetic flux density at a point on the axis of a loop of radius 'b' that carries a direct current I. | C203.3 | 1,2 |
| T.3.4 | A thin cylindrical conductor of radius 'a' infinite in length carries a current I. Find H at all points? | C203.3 | 1,2 |

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| T.3.5 | An iron ring with a cross sectional area of 3 $cm^2$ and a mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3 A. The relative permeability of the ring is 1500. Calculate the flux established in the ring. | C203.3 | 1,2 |
| T.3.6 | Determine the force between two long parallel wires of 200 m length separated by 5 cm in air and carrying currents of 40 A in same direction and in opposite direction. | C203.3 | 1,2 |
| T.3.7 | Two coils when connected in series aiding have a total inductance of 860 mH and when connected in series opposing the total inductance is 140 mH. One coil has 4 times the inductance of the other. Calculate the inductance of each coil, the mutual inductance and co-efficient of coupling. | C203.3 | 1,2 |
| T.3.8 | A magnetic material has $\mu_r = 10/\pi$ and is in a magnetic field of strength $\bar{\boldsymbol{H}} = 5\boldsymbol{\rho}^3\bar{\boldsymbol{a}}_{\boldsymbol{\varphi}}\ \boldsymbol{A/m}$. Find the magnetization | C203.3 | 1,2 |
| T.3.9 | A solenoid has 400 turns with a length of 2 m. It has a circular cross section of 0.1 $m^2$ . Find its inductance. | C203.3 | 1,2 |
| T.3.10 | Consider a co-axial cable with inner conductor radius 'a' carrying current I, while – I is uniformly distributed in the outer conductor. The outer conductor is in the form of concentric cylinder whose inner radius is 'b' and outer radius is 'c'. Obtain the expression for magnetic field intensity $\bar{\boldsymbol{H}}$ for the following regions, applying Amperes law (a) region r < a (b) region between 'a' and 'b' (i.e. a < r < b) (c) region between b and c and (d) region r > c. | C203.3 | 1,2 |
| T.4.1 | Calculate the induced emf at t = 10 sec when the flux through each turn of 200 turn coil is t (t -1) mWb? | C203.4 | 1,2 |
| T.4.2 | A parallel-plate capacitor with plate area of 5 $cm^2$ and plate separation of 3 mm has a voltage 50 sin $10^3$ t V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\ \varepsilon_0$. | C203.4 | 1,2 |
| T.4.3 | If the electric field strength of a radio broadcast signal at a TV receiver is given by **E** = 5.0 cos ($\omega t - \beta y$) $\mathbf{a_z}$, V/m, determine the displacement current density. If the same field exists in a medium whose conductivity | C203.4 | 1,2 |
| T.5.1 | Find the velocity of a plane wave in a loss-less medium having a relative permittivity of 5 and relative permeability of unity and determine the skin depth of copper at 60Hz with $\sigma$ = 5.8 X $10^7$ S/m. Given $\mu_r = 1$; | C203.5 | 1,2 |
| T.5.2 | A plane wave propagating through a medium with $\mu_r = 2, \varepsilon_r = 8$ has E = 0.5 sin ($10^8$ t- $\beta z$) $\bar{\mathbf{a}}_\mathbf{x}$ V/m. Determine the propagation parameters and H fields? | C203.5 | 1,2 |
| T.5.3 | In free space E (z ,t) = 50 cos ($\omega t - \beta z$) ax V/m. Find the average power crossing a circular area of radius 2.5 m in the constant Z- Plane. | C203.5 | 1,2 |
| | **4. Seminar/Self study topics.** | | |
| S.1.1 | Application of Electrostatic field | C203.2 | 1 |
| S.1.2 | Application of Magnetostatic field | C203.3 | 1 |

**K.L.N. College of Engineering**

Department of Electrical and Electronics Engineering

**GE6351 – ENVIRONMENTAL SCIENCE AND ENGINEERING [C204]**

**Important Questions/Tutorials/Assignments/Self study /Seminar topics.**

| S.No. | Important Questions. | COs | POs |
|---|---|---|---|
| Q.1.1. | Explain the various threats to biodiversity. What are the causes for loss of biodiversity? | C204.1 | 6 |
| Q.1.2. | What is meant by value of biodiversity? Explain different values of biodiversity. Explain in-situ and ex-situ conservation of biodiversity. | C204.1 | 6 |
| Q.1.3. | Briefly explain the structural and functional components of an ecosystem and energy flow through ecosystem. | C204.1 | 6 |
| Q.1.4. | What are the cycles in ecosystems? Describe carbon cycle and biogeochemical cycle in the ecosystem. | C204.1 | 6 |
| Q.1.5. | Discuss the characteristic features, structure and function of a) desert ecosystem b) forest ecosystem and c) aquatic ecosystem. | C204.1 | 6 |
| Q.2.1. | Explain the methods of disposal of municipal solid waste and radioactive wastes. | C204.1 | 7 |
| Q2.2. | Explain the causes, effects and control measures of a) marine pollution b) water pollution c) nuclear and radiation pollution. | C204.2 | 7 |
| Q.2.3. | Describe the sources, effects, and control of noise pollution and soil pollutions (with impacts) | C204.2 | 7 |
| Q2.4. | Discuss in detail about a) waste water treatment process b) acid rain formation and its effects | C204.2 | 7 |
| Q.2.5. | Discuss in detail about the Bhopal gas tragedy and Chernobyl nuclear disaster. | C204.2 | 6,7 |
| Q.3.1. | Discuss briefly the ill-effects of deforestation and effects of modern Agriculture. | C204.3 | 6 |
| Q.3.2. | What are the causes of soil erosion and deforestation? Explain in detail. | C204.3 | 7 |
| Q.3.3. | Explain the role of individual in environment protection and ecological benefits of forest. | C204.3 | 7 |
| Q.3.4. | Explain a) benefits and problems of constructing dam b) effects of dams on forest and tribal people. | C204.3 | 7 |
| Q.4.1. | Explain watershed management and agenda for sustainable development. | C204.4 | 6 |
| Q.4.2. | Explain the rain water harvesting and need and strategy of water conservation. | C204.4 | 7 |
| Q.4.3. | Explain resettlement and rehabilitation issues. | C204.4 | 7 |
| Q.4.4. | What is consumerism? Mention the objectives and factors affecting consumerism. | C204.4 | 7 |
| Q.4.5. | What is biomedical waste? Give the steps involve in management of biomedical wastes. | C204.4 | 7 |
| Q.4.6. | What is an earthquake? Enumerate its effects. Mention the methods to mitigate the disaster. | C204.4 | 7 |
| Q.5.1. | Explain briefly the population explosion and family welfare program, training and development. | C204.5 | 7 |
| Q5.2. | Explain a) HIV/AIDS b) various policies and programs for women and child development. | C204.5 | 7 |
| Q.5.3. | Write short notes on a) women and child welfare b) human rights c) value education. Ii) outline the various family welfare plans in the post independent India. | C204.5 | 6 |
| Q.5.4. | Explain the role of NGOs in environmental protection and health. | C204.5 | 7 |
| Q.5.5. | Discuss EIA? Give the objectives, benefits and process of EIA. | C204.5 | 7 |
| | **Assignments/Seminar/Self study topics.** | | |
| A.1.1. | **Differentiate a food chain and food web.** | C204.1 | 6 |
| A.1.2. | Distinguish between primary succession and secondary succession. | C204.1 | 6 |
| A.1.3. | **What are endangered and endemic species?** | C204.1 | 6 |
| A.1.4. | Briefly explain the energy flow through ecosystem. | C204.1 | 6 |
| A.1.5. | **Explain the structural and functional components of an ecosystem.** | C204.1 | 6 |
| A.1.6 | Explain the effects of nuclear and Radiation pollution. | C204.1 | 6 |

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|---|---|---|---|
| A.1.7 | What is acid rain? How it is formed? Give its effects. | C204.1 | 6 |
| A.2.1 | Distinguish between water logging & Salinity. | C204.2 | 6 |
| A.2.2 | Give the steps involved in anaerobic digest in process. | C204.2 | 7 |
| A.2.3 | State a few drawbacks of pollution related acts. | C204.2 | 7 |
| A.2.4 | Name any four environmental protection acts. | C204.2 | 7 |
| A.2.5 | Compare nuclear power with coal power. | C204.2 | 7 |
| A.2.6 | What is a biomedical waste? Give the steps involved in management of biomedical waste. | C204.2 | 7 |
| A.5.1. | Define the term population dynamics. | C204.5 | 7 |
| A.5.2 | What are the policies for women development? | C204.5 | 7 |
| A.5.3 | Define human rights. | C204.5 | 7 |
| A.5.4 | Explain briefly the population explosion. | C204.5 | 6 |
| A.5.5 | Explain the value of education. | C204.5 | 6 |
| C.2.1 | Pollution case studies<br>• Bhopal gas tragedy<br>• Chernobyl Reactor Incident<br>• Environmental Impact of Iceland Volcanic Eruption<br>• Cashew in Kasargod, Kerala Poisonous Nuts<br>• Groundwater Pollution in India<br>• Marine Pollution in Tamil Nadu: Oceans Not Spared<br>• Noise Hits Whales in Hong Kong | C204.2 | 6 |
| C.3.1 | Case Studies<br>• Mining and quarrying in Udaipur<br>• Mining in Sariska and Tiger Reserve in Aravallis | C204.3 | 6 |
| C.4.1 | Nuclear Accidents and Holocaust- Case Studies | C204.4 | 6 |

**K.L.N. College of Engineering**

**Department of Electrical and Electronics Engineering**

**EC6202 - ELECTRONIC DEVICES AND CIRCUITS [C205]**

**Important Questions/Assignments/ Self-study Topics/Seminar topics.**

## 1. IMPORTANT QUESTIONS:

| S.No. | Important Questions. | COs | POs |
|---|---|---|---|
| **UNIT – I : PN JUNCTION DEVICES** | | | |
| **Q.1.1.** | Draw the symbol and structure of PN and Zener Diode.<br>List the applications of PN and Zener Diode. | C205.1 | 1 |
| Q.1.2. | Define knee voltage of a diode. | C205.1 | 1 |
| Q.1.3. | What is meant by depletion region? | C205.1 | 1 |
| Q.1.4. | Draw the VI characteristics of PN junction diode & Zener diode. | C205.1 | 1 |
| **Q.1.5.** | Define diode resistance. (or) static and dynamic resistance of PN diode. | C205.1 | 1 |
| Q.1.6. | Relate voltage and current of forward biased PN junction diode. | C205.1 | 1,2 |
| **Q.1.7.** | What is transition and diffusion capacitance of PN junction diode? | C205.1 | 1 |
| **Q.1.8.** | What is a rectifier? Name it's types. | C205.1 | 1 |
| Q.1.9. | Define PIV & TUF. | C205.1 | 1 |
| Q.1.10. | Derive the ripple factor of FWR. | C205.1 | 1 |
| Q.1.11. | Mention the advantage of bridge rectifier over full wave rectifier. | C205.1 | 1 |
| Q.1.12. | Compare full wave with half wave rectifier. | C205.1 | 1 |
| **Q.1.13.** | What is LED and Laser Diode? Draw the symbol and structure of it. | C205.1 | 1 |
| Q.1.14. | What are the advantages and disadvantage of LED? | C205.1 | 1 |
| Q.1.15. | Compare LED and PN diode. | C205.1 | 1 |
| **Q.1.16.** | List the applications of LED and LASER diode. | C205.1 | 1 |
| **Q.1.17.** | Differentiate between Zener breakdown and Avalanche breakdown. | C205.1 | 1 |
| **UNIT – II : TRANSISTORS** | | | |
| Q.2.1. | Draw the symbol & structure of BJT, JFET, MOSFET, UJT, SCR & IGBT. | C205.2 | 1 |
| Q.2.2. | What is transistor? What are the types and advantages of it. | C205.2 | 1 |
| Q.2.3. | Draw the circuit of NPN and PNP transistor in CE, CB and CC configurations. | C205.2 | 1 |
| Q.2.4. | State the relation between $\alpha$, $\beta$ and $\gamma$. | C205.2 | 1 |
| Q.2.5. | What are the operating modes of BJT with reference to junction biasing? | C205.2 | 1 |
| Q.2.6. | Why BJT is called as current controlled device? | C205.2 | 1 |
| Q.2.7. | Among CE, CB and CC configurations, which one is most popular? Why? | C205.2 | 1 |
| **Q.2.8.** | What is meant by biasing? | C205.2 | 1 |
| Q.2.9. | Define pinch-off voltage of FET. | C205.2 | 1 |
| Q.2.10. | Why FET is called as voltage controlled device? | C205.2 | 1 |
| **Q.2.11.** | Draw the drain and transfer characteristics of JFET and indicate the operating regions. | C205.2 | 1 |
| Q.2.12. | Write the relation between JFET parameters. | C205.2 | 1,2 |
| Q.2.13. | Why are N-channel MOSFET preferred over P-channel MOSFET? | C205.2 | 1 |
| **Q.2.14.** | Compare BJT, JFET and MOSFET. (Differentiate between JFET & MOSFET) | C205.2 | 1 |
| Q.2.15. | What is MOSFET? Name its types. | C205.2 | 1 |
| **Q.2.16.** | What is a thyristor? Mention two of them. | C205.2 | 1 |
| Q.2.17. | What is meant by latching and holding current in SCR? | C205.2 | 1 |
| **Q.2.18** | Show how an SCR can be triggered on by the application of a pulse to the Gate terminal. | C205.2 | 1 |
| Q.2.19. | List the merits, demerits and applications of UJT, SCR and IGBT. | C205.2 | 1 |
| **Q.2.20.** | What is intrinsic stand-off ratio of a UJT? Draw its equivalent circuit | C205.2 | 1 |

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| **Q.2.21.** | Define Early effect. | C205.2 | 1 |
| **UNIT – III : AMPLIFIERS** | | | |
| **Q.3.1.** | What are amplifiers? Write its uses. | C205.3 | 1 |
| **Q.3.2.** | Define the four h-parameters. | C205.3 | 1 |
| **Q.3.3.** | What is the need of coupling capacitors in amplifier design? | C205.3 | 1 |
| **Q.3.4.** | Draw the hybrid small signal model of BJT device. (or) CE, CB & CC Configuration. | C205.3 | 1 |
| Q.3.5. | Draw the circuit diagram of CS and CD FET amplifier | C205.3 | 1 |
| **Q.3.6.** | Draw the small signal equivalent circuit of a CS & CD FET. | C205.3 | 1 |
| Q.3.7. | Draw the frequency response of an amplifier | C205.3 | 1 |
| Q.3.8. | What are the effect of coupling and bypass capacitors? | C205.3 | 1 |
| Q.3.9. | Discuss the significance of cut-off frequencies. | C205.3 | 1 |
| **Q.3.10.** | State Miller's theorem. | C205.3 | 1 |
| **Q.3.11.** | Compare the performances of transistor configuration (or) characteristics of CE, CB and CC amplifiers. | C205.3 | 1 |
| **Q.3.12.** | Differentiate between power transistor and signal transistor. | C205.3 | 1 |
| Q.3.13. | Draw the high frequency equivalent circuit of MOSFET. | C205.3 | 1 |
| Q.3.14. | What is darlington pair? | C205.3 | 1 |
| **UNIT – IV : MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER** | | | |
| **Q.4.1.** | What are cascade amplifiers? Write down the need of cascading the amplifiers. | C205.4 | 1 |
| **Q.4.2.** | Define CMRR. What is its ideal value? (or) What is the value of CMRR for ideal cases? | C205.4 | 1 |
| **Q.4.3.** | Write its significance & List the various methods of improving CMRR.(or) how to improve it? | C205.4 | 1 |
| Q.4.4. | Mention the classification of differential amplifier. State the advantage of it. | C205.4 | 1 |
| **Q.4.5.** | Draw the ideal tuned circuit and write the expression for its resonant frequency. | C205.4 | 1 |
| Q.4.6. | Draw the ideal and actual response of tuned circuit. | C205.4 | 1 |
| Q.4.7. | Define Q factor & dissipation factor. | C205.4 | 1 |
| **Q.4.8.** | What is neutralization? What is the need for neutralization? List the methods of it. | C205.4 | 1 |
| Q.4.9. | List the advantages, dis advantages and applications of tuned amplifier. | C205.4 | 1 |
| Q.4.10. | What is power amplifier? Classify it. | C205.4 | 1 |
| **Q.4.11.** | Define conversion efficiency of power amplifier. | C205.4 | 1 |
| Q.4.12. | State the feature of large signal amplifier. | C205.4 | 1 |
| Q.4.13. | Compare the amplifier classes. | C205.4 | 1 |
| **UNIT – V : FEEDBACK AMPLIFIERS AND OSCILLATORS** | | | |
| Q.5.1. | Draw the block diagram of feedback amplifier. Name the types of feedback amplifier. | C205.5 | 1 |
| Q.5.2. | Name the types of feedback topologies. | C205.5 | 1 |
| **Q.5.3.** | Mention the advantages and disadvantages of negative feedback amplifier. How it can be overcome? | C205.5 | 1 |
| **Q.5.4.** | Which is the most commonly used feedback arrangement in cascaded amplifier? why? | C205.5 | 1 |
| Q.5.5. | What is meant by feedback? | C205.5 | 1 |
| **Q.5.6.** | State the Barkhausen criterion for an oscillator. | C205.5 | 1 |
| **Q.5.7.** | Write the expression for the frequency of oscillations of RC, LC & Crystal oscillator. | C205.5 | 1,2 |
| Q.5.8. | List the advantage, disadvantage & application of oscillators. | C205.5 | 1 |
| **Q.5.9.** | What is the advantage of colpitts oscillator compared to phase shift oscillator? | C205.5 | 1 |
| Q.5.10. | Compare RC phase shift and wien bridge oscillator. | C205.5 | 1 |
| **Q.5.11.** | Differentiate oscillator with amplifier. | C205.5 | 1 |
| Q.5.12. | State Piezo electric effect. | C205.5 | 1 |
| Q.5.13. | Comment the stability of feedback amplifier. | C205.5 | 1 |
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## Assignments

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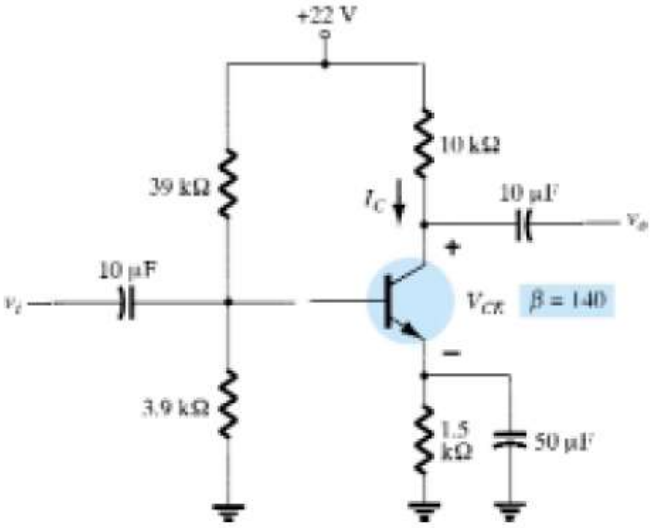
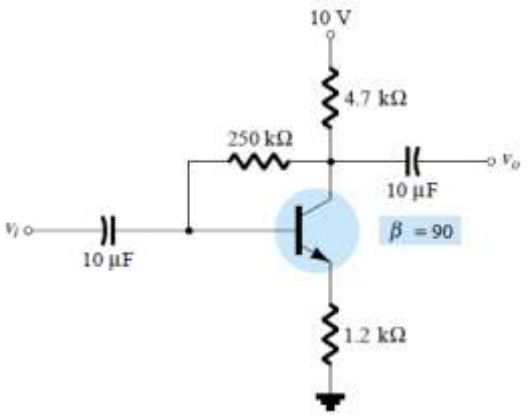
| **UNIT – I : PN JUNCTION DEVICES** | | **Assignment No:1** | |
| A.1.1. | Determine the the GE PN junction diode current for the forward bias voltage of 0.22V at room temperature 25°C with reverse saturation current is 1mA. Taken $\eta = 1$. [Ref: Ex.4.13 / Page 111 / S.Salivahanan-3rd edition] | C205.1 | 1,2 |
| A.1.2. | Draw the ideal and practical zener diode equivalent circuit. [Ref: fig 2.30/ Page 64 / David A Bell -5th edition] | C205.1 | 1 |
| A.1.3. | In a zener regulator, the dc input is 10V±20%. The output requirements are 5V, 20mA. Assume $I_{Z,min}$ and $I_{Z,max}$ as 5mA and 80A. Design the zener regulator. [Ref: Ex.18.32 / Page 757 / S.Salivahanan-3rd edition] | C205.1 | 1,2,3 |
| A.1.4. | A HWR is used to supply 30v DC to a R load of 600Ω. The diode has a $R_F$ of 25Ω. Find the maximum value of the ac voltage required at the input. [Ref: Ex.19.4 / Page 486 / R.S.Sedha –revised 2013 edition] | C205.1 | 1,2 |
| A.1.5. | The $V_o$ of a dc power supply changes from 20v 7to 19.7v when the load is increased from zero to maximum. The voltage also increases to 20.2v when the ac supply increases by 10%. Calculate the load and source effects and the load and line regulations. [Ref: Ex.3.15 / Page 105 / David A Bell -5th edition] | C205.1 | 1,2 |
| **UNIT – II : TRANSISTORS** | | **Assignment No:2** | |
| A.2.1. | A JFET amplifier has $g_m = 2.5mA/V$, $R_L = 10k\Omega$ and $r_D = 500k\Omega$. find the value of voltage gain. [Ref: Ex.30.10 / Page 894 / R.S.Sedha –revised 2013 edition] | C205.2 | 1,2 |
| A.2.2. | Determine the dc bias voltage $V_{CE}$ and the current $I_C$ for the voltage-divider configuration of Fig. R1 = 39kΩ, R2 = 3.9kΩ, Rc = 10kΩ, Re = 1.5kΩ, C1 = C2 = 10μF, Ce = 50μF, β = 140 & Vcc = 22V. [Ref: Ex.4.7 / Page 159 / Robert Boylestad- 7th edition]   | C205.2 | 1,2 |
| A.2.3. | Determine the quiescent levels of $I_{CQ}$ and $V_{CEQ}$ for the network of Fig.   [Ref: Ex.4.11 / Page 166 / Robert Boylestad- 7th edition] | C205.2 | 1,2 |

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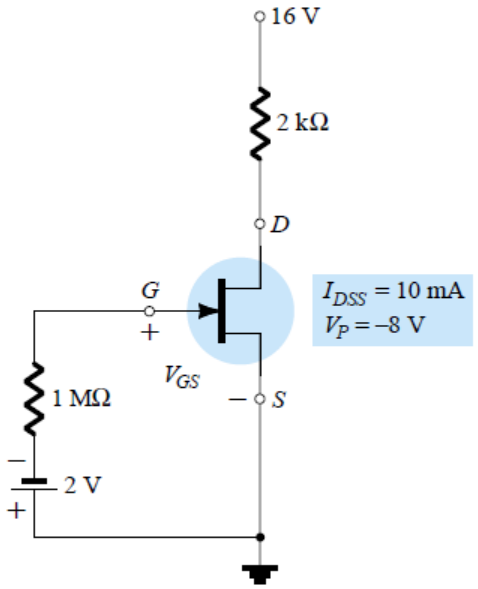
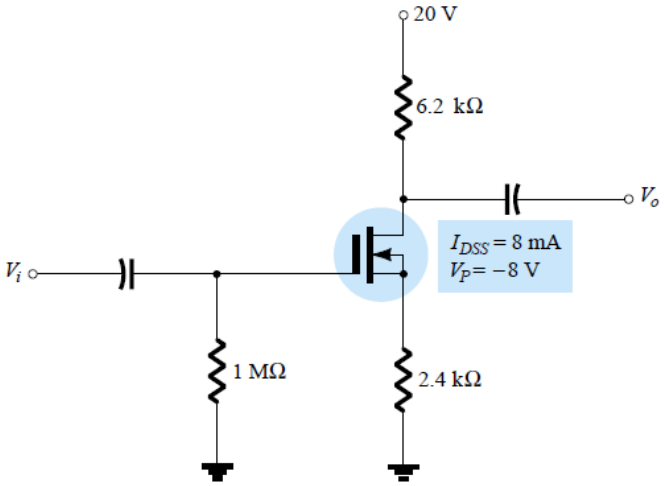
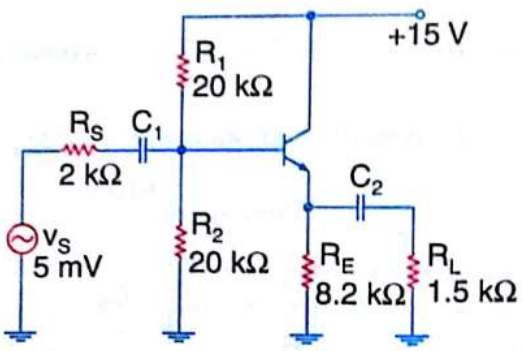
| A.2.4. | Determine the following for the network of Fig. (a) $V_{GSQ}$. (b) $I_{DQ}$. (c) $V_{DS}$. (d) $V_D$. (e) $V_G$. (f) $V_S$.<br>  <br><br>[Ref: Ex.6.1 / Page 257 / Robert Boylestad- 7th edition] | C205.2 | 1,2 |
| A.2.5. | Determine the following for the network of Fig. (a) $I_{DQ}$ and $V_{GSQ}$. (b) $V_D$.<br>[Ref: Ex.6.9 / Page 273 / Robert Boylestad- 7th edition]<br>  <br> | C205.2 | 1,2 |
| **UNIT – III : AMPLIFIERS** | | | **Assignment No:3** |
| A.3.1. | A CB transistor amplifier is driven by a voltage source $V_S$ and internal resistance $R_S$ = 1200Ω. The load impedance is a resistor $R_L$ of 1000Ω. The h parameters are given below: $h_{ib}$ 220Ω, $h_{rb}$ = 3 x $10^{-4}$, $h_{fb}$ = -0.98, $h_{ob}$ = 0.5μA/V. compute $A_i$, $A_V$, $R_i$, $R_o$ & $A_P$.<br>*AU R2008 / Nov 2012 – 16 Marks [Ref: Ex.9.5 / Page 295 /* S.Salivahanan-3rd edition*]* | C205.3 | 1,2 |
| A.3.2. | The emitter follower circuit shown in fig. uses a voltage divider bias arrangement. The transistor has a current gain of 80 and $V_{BE}$ = 0.7v.<br>  <br><br>*AU R2013 / Nov 2015 – 8 Marks* [Ref: Ex.24.15 / Page 702 / R.S.Sedha –revised 2013 edition] | C205.3 | 1,2 |

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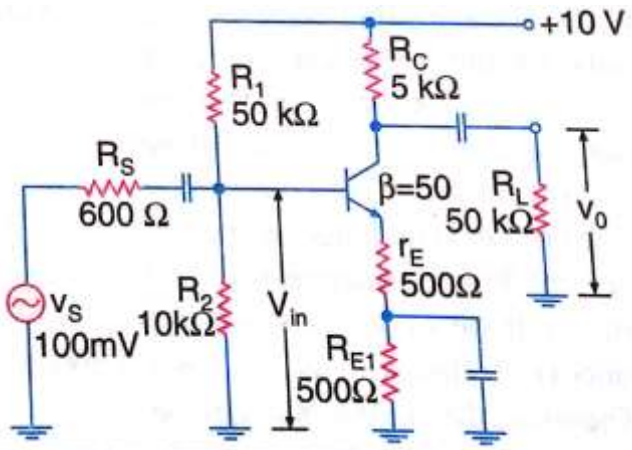
| A.3.3. | For an amplifier, mid band gain = 100 and lower cutoff frequency is 1KHz. Find the gain of an amplifier at a frequency of 20Hz.<br>*AU R2013 / Nov 2014 –2 Marks* [Ref: Ex.6.9.2 / Page 6.45 / A.P.Godse-2014] | C205.3 | 1,2 |
| A.3.4. | Determine the LF response of the amplifier. The parameters are $V_{cc}$ = 10V, $R_1$ = 68KΩ, $R_2$ = 22KΩ, $R_c$ = 2.2KΩ, $R_E$ = 1KΩ, $R_L$ = 10KΩ, $R_s$ = 680Ω, $C_1$=$C_2$ = 0.1μF, $C_E$=10μF & β = 100.<br>[Ref: Ex.3.17 / Page 3.67 / T.Joel-2014] | C205.3 | 1,2 |
| A.3.5. | A FET amplifier in the CS configuration uses a $R_L$ of 500kΩ. the ac drain resistance of the device is 100kΩ and the transconductance is 0.8 $mAV^{-1}$. Calculate the voltage gain of the amplifier. *[Ref: Ex.9.21 / Page 342 /* S.Salivahanan-3rd edition*]* | C205.3 | 1,2 |
| | **TUTORIALS** | | |
| **UNIT – I : PN JUNCTION DEVICES** | | **Tutorial No:1,2&3** | |
| **T.1.1** | A Si diode has saturation current 7.5μA at room temperature 300k. Find the saturation current at 400k. | C205.1 | 1,2 |
| **T.1.2** | Calculate the diffusion capacitance for a Si diode with a 15mA forward current, if the charge carrier transit time is 70nS. | C205.1 | 1,2 |
| **T.1.3** | A Si diode has a bulk resistance of 2Ω and a $I_F$ of 12mA. What is the actual value of $V_F$ for the device. | C205.1 | 1,2 |
| **T.1.4** | A 4.5v zener is rated at 1.5W. What is the max safe current of the zener? | C205.1 | 1,2 |
| **T.1.5** | A FWR delivers 50W to a load of 200Ω. If the ripple factor is 1%, calculate the ac ripple voltage across the load. | C205.1 | 1,2 |
| **UNIT – II : TRANSISTORS** | | **Tutorial No:4,5&6** | |
| **T.2.1** | Calculate β of a transistor when α = 0.98. | C205.2 | 1,2 |
| **T.2.2** | A transistor has a typical β of 100. If the $I_C$ is 40 mA, what is the value of $I_E$? | C205.2 | 1,2 |
| **T.2.3** | Calculate $I_C$ & $I_E$ for a transistor that has $\alpha_{dc}$ = 0.99 and $I_B$ = 150μA. Determine the value of $\beta_{dc}$ for the transistor. | C205.2 | 1,2 |
| **T.2.4** | Determine the $I_B$ for the CE transistor circuit if $I_C$ = 80mA and β = 170. | C205.2 | 1,2 |
| **T.2.5** | A CE amplifier has an $R_i$ 2.5kΩ and voltage gain of 200. If the input signal voltage is 5mV. Find the $I_B$ of the amplifier. | C205.2 | 1,2 |
| **T.2.6** | Design a voltage divider bias circuit for transistor to establish the Q point at $V_{CE}$=12v, $I_C$=1.5mA, stability factor S≤3, β=50, $V_{BE}$ = 0.7v, $V_{CC}$ = 22.5v & $R_C$=5.6kΩ. | C205.2 | 1,2 |
| **T.2.7** | For CS amplifier, the operating point is defined by $V_{GSQ}$ =-2.5v, $V_P$ = -6v & $I_{dQ}$ = 2.5mA with $I_{DSS}$ = 8mA. Also $R_G$ = 1MΩ, $R_S$ = 1kΩ, $R_D$ = 2.2kΩ and $V_{DD}$ =15v. calculate $g_m$, $r_d$, $Z_i$, $Z_o$ and $A_v$. | C205.2 | 1,2 |
| **UNIT – III : AMPLIFIERS** | | **Tutorial No:7,8&9** | |
| **T.3.1** | A CE amplifier as shown in fig. Determine the $R_i$, ac load resistance, voltage gain & output voltage.<br>  | C205.3 | 1,2 |
| **T.3.2** | Evaluate the $A_i$, $A_V$, $R_i$, $R_o$, $A_{is}$, $A_{vs}$ of a single stage CE amplifier with $R_s$ = 1kΩ, $R_1$ = 22kΩ, $R_2$ = 10kΩ, $R_C$ = 2kΩ, $R_L$ = 2kΩ, $h_{fe}$ = 50, $h_{ie}$ = 1.1kΩ, $h_{oe}$ = 25μA/V and $h_{re}$ = 2.5 x | C205.3 | 1,2 |

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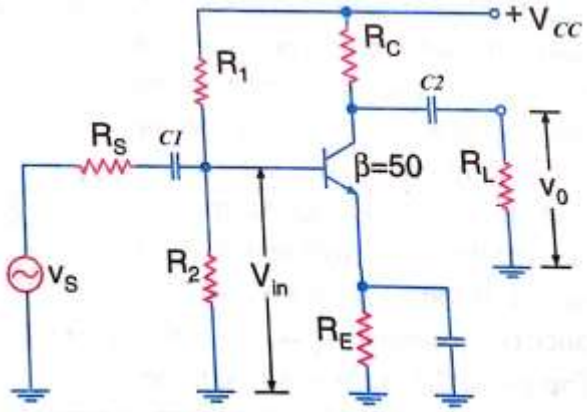
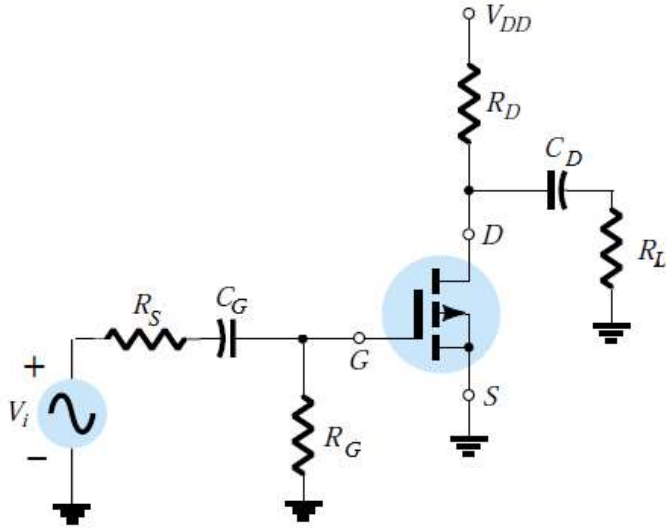
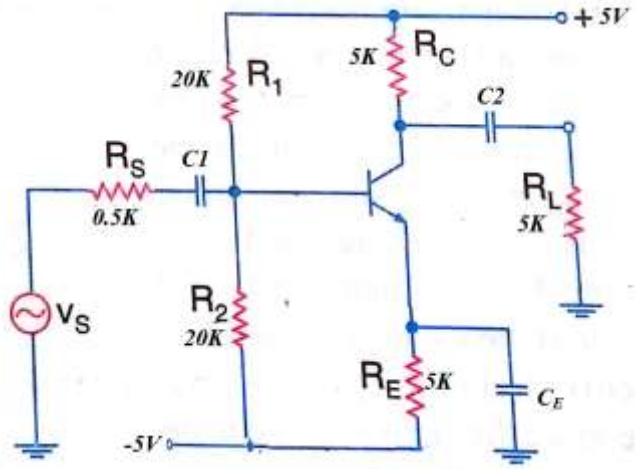
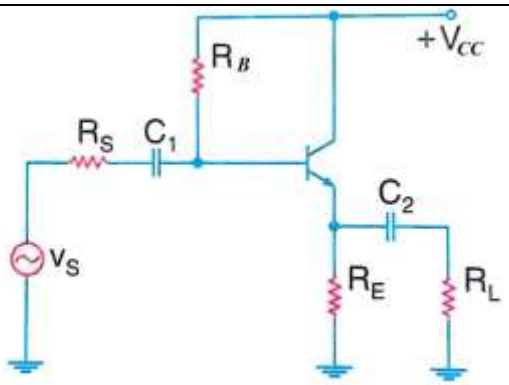
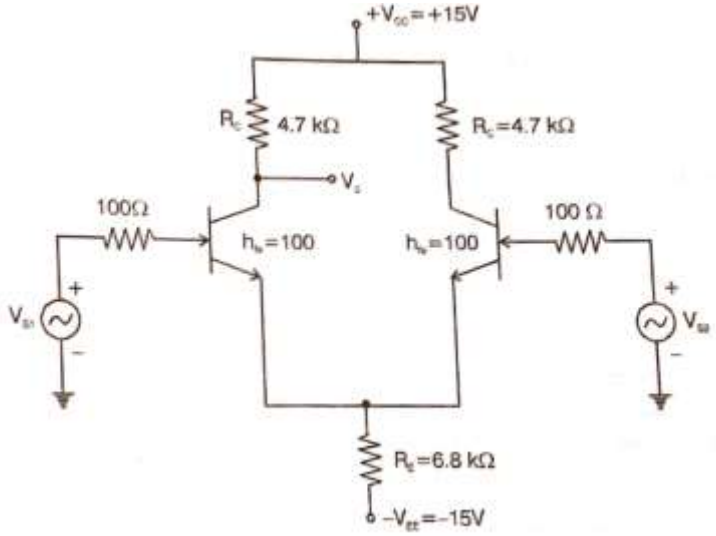
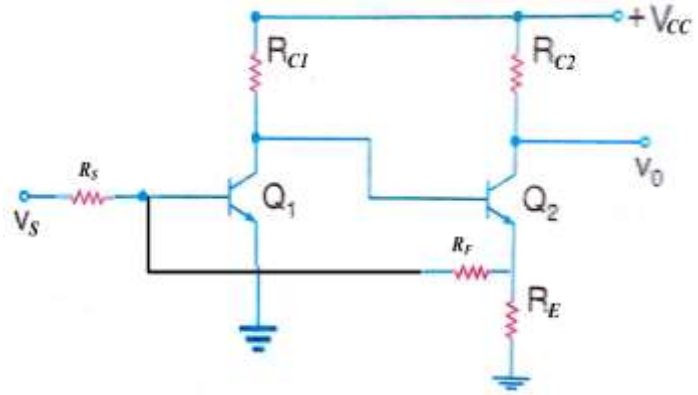
| | $10^{-4}$. fig.<br>  <br> | | |
| **T.3.3** | Determine the mid band gain, upper cutoff frequency of a CS amplifier fed with the signal having internal resistance $R_{sig}$ = 100kΩ as shown in fig. the amplifier has $R_G$ = 4.7MΩ, $R_D$ = $R_L$ = 15kΩ, $g_m$ = 1mA/v, $r_o$ = 150kΩ, $C_{gs}$ = 1pF & $C_{gd}$ = 0.4pF.<br>  <br> | C205.3 | 1,2 |
| **T.3.4** | Determine the mid band gain and BW of a CE amplifier as shown in fig. assume lower cutoff frequency is 100Hz. Let $h_{fe}$ = β = 100, $C_{be}$ = 4pF, $C_{bc}$ = 0.2pF & $V_A$ = ∞.<br>  <br> | C205.3 | 1,2 |
| **T.3.5** | A CB transistor amplifier is driven by a voltage source $V_S$ and internal resistance $R_S$ = 1200Ω. The load impedance is a resistor $R_L$ of 1000Ω. The h parameters are given below: $h_{ib}$ 220Ω, $h_{rb}$ = 3 x $10^{-4}$, $h_{fb}$ = -0.98, $h_{ob}$ = 0.5μA/V. compute $A_i$, $A_V$, $R_i$, $R_o$ & $A_P$. | C205.3 | 1,2 |
| **T.3.6** | A CC amplifier shown in fig has $V_{CC}$ = 15 v, $R_B$ = 75kΩ and $R_E$ = 910Ω, β = 100 and the $R_L$ = 600Ω. Find $r_{in}$ & $A_V$. | C205.3 | 1,2 |

| | | | |
|---|---|---|---|
| |  | | |
| **UNIT – IV : MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER** | | | **Tutorial No:10,11&12** |
| **T.4.1** | A tuned circuit has a resonant frequency of 1600KHz and a BW of 10KHz. What is the value of its Q factor? | C205.4 | 1,2 |
| **T.4.2** | CMRR of an amplifier is 100 dB, calculate common mode gain, if the differential gain is 1000. | C205.4 | 1,2 |
| **T.4.3** | Evaluate the operating point, differential gain, common mode gain, CMRR and $V_o$ if $V_{S1}$ = 70mv peak to peak at 1kHz and $V_{S2}$=40mv peak to peak at 1kHz of dual input balanced output differential amplifier, $h_{ie}$=2.8kΩ fig.  | C205.4 | 1,2 |
| **T.4.4** | A tuned circuit has a capacitor of 100pF and an inductor of 100μH. The resistance of the inductor is 5Ω. Determine the resonant frequency, impedance at resonance, Q-factor and BW. | C205.4 | 1,2 |
| **T.4.5** | A power transistor working in class A operation has zero signal power dissipation of 10W. if the ac output power is 4W, find collector efficiency, power rating of the transistor. | C205.4 | 1,2 |
| **UNIT – V : FEEDBACK AMPLIFIERS AND OSCILLATORS** | | | **Tutorial No:13,14&15** |
| **T.5.1** | Identify the nature of feedback in fig. let $R_{C1}$ = 3kΩ, $R_{C2}$ = 500Ω, $R_E$ = 50Ω, $R_S$ = $R_F$ = 1.2kΩ, $h_{fe}$ = 50, $h_{ie}$ = 1.1kΩ, $h_{re}$ = $h_{oe}$ = 0. Determine overall voltage gain $A_{Vf}$, overall current gain $A_{if}$, input impedance $R_{if}$ & output impedance $R_{of.}$ | C205.5 | 1,2 |

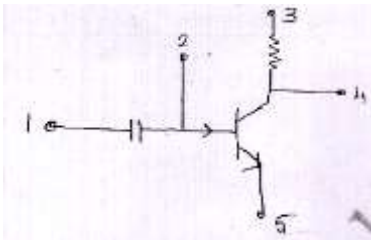
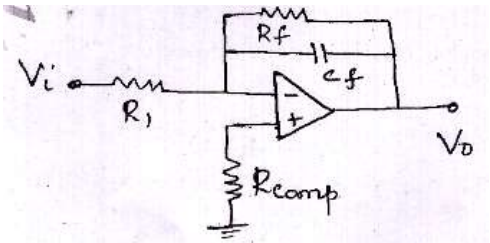
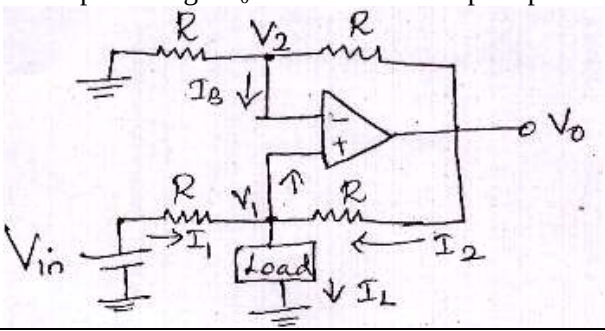
| | | | |
|---|---|---|---|
| |  | | |
| **T.5.2** | Design an oscillator to operate at a frequency of 10kHz which gives an extremely pure sine wave output, good frequency stability and highly stabilized amplitude. (wien bridge) | C205.5 | 1,2 |
| **T.5.3** | Design a RC phase shift oscillator to generate 5kHZ sine wave with 20V peak to peak amplitude. Assume $h_{fe} = \beta = 150$, C = 1.5nF, $h_{re} = 1.2k\Omega$. | C205.5 | 1,2 |
| **T.5.4** | In colpitts oscillator C1 = 1nF & C2 = 100nF. If the frequency of oscillation is 100kHz find the value of inductor. Also find the minimum gain required for obtaining sustained oscillations. | C205.5 | 1,2 |
| **T.5.5** | In an Hartley oscillator if L1 = 0.1mH, L2 = 10μH and mutual inductance between the coils equal to 20μH. Calculate the value of C of the oscillatory circuit to obtain frequency of 4110kH and also find the condition for sustained oscillations. | C205.5 | 1,2 |
| **T.5.6** | A crystal has the following parameters: L = 0.33H, C = 0.065pF, C2 = 1pF & R = 5.5kΩ. Find the series resonant frequency and Q factor of the crystal. | C205.5 | 1,2 |
| **Seminar / Self-study topics.** | | | |
| Sem.1. | Special purpose diodes | C205. | |
| Sem.2. | LCD | C205. | |
| Sem.3. | Opto coupler | C205. | |
| Sem.4. | Multivibrators | C205. | |
| Sem.5. | Wave shaping circuits | C205. | |
| Sem.6. | Cascade amplifier | C205. | |
| Sem.7. | Transistor Darlington connection | C205. | |
| Sem.8. | Light activated relay circuits | C205. | |
| Sem.9. | SMPS | C205. | |
| Sel.1. | Opto electronic devices | C205. | |
| Sel.2. | CRO | C205. | |
| Sel.3. | Filters | C205. | |

**K.L.N. College of Engineering**

**Department of Electrical and Electronics Engineering**

**EE6303 –LINEAR INTEGRATED CIRCUITS & APPLICATIONS [C206]**

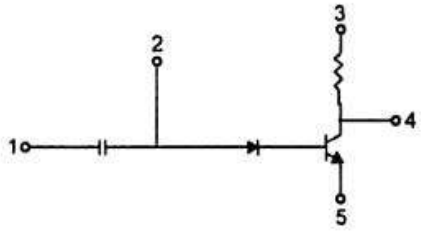
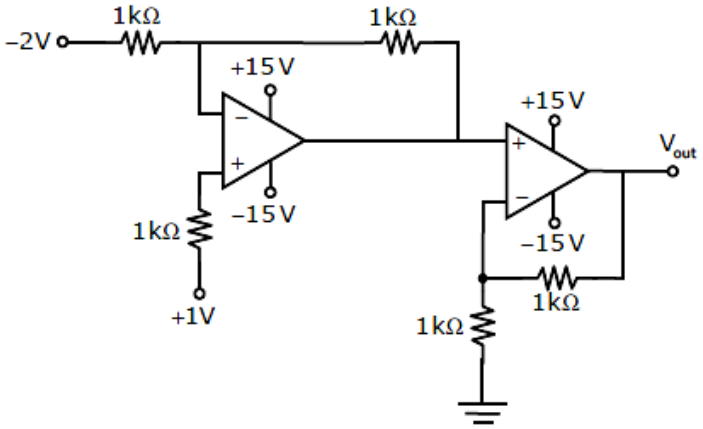
**Important Questions /Assignments /Self study /Seminar topics**

| IMPORTANT QUESTIONS | | | |
|---|---|---|---|
| **S. No.** | **Questions** | **COs** | **POs** |
| | **UNIT – I IC FABRICATION** | | |
| Q.1.1 | Explain the fabrication process involved in the following circuit diagram.   | C206.1 | 1,3,6,12 |
| Q.1.2 | Explain the process of masking and photo etching in IC fabrication. | C206.1 | 1 |
| Q.1.3 | Discuss the different ways to fabricate diodes. | C206.1 | 1,3 |
| Q.1.4 | Explain how a monolithic capacitor can be fabricated. | C206.1 | 1,3 |
| Q.1.5 | Describe the Epitaxial growth process. | C206.1 | 1 |
| Q.1.6 | Explain the different types of IC packages with examples. | C206.1 | 1 |
| Q.1.7 | Briefly explain the various processes involved in fabrication of monolithic IC which integrated diode, capacitance and FET. | C206.1 | 1,3 |
| Q.1.8 | Explain the process of Ion implantation and state its advantages. | C206.1 | 1 |
| Q.1.9 | List the merits of integrated circuits over discrete circuits. | C206.1 | 1 |
| Q.1.10 | Explain the process of Photolithography and diffusion. | C206.1 | 1 |
| | **UNIT – II CHARACTERISTICS OF OP-AMP** | | |
| Q.2.1 | Consider the lossy integrator as shown in following figure. For the component value $R_1$=10 kΩ, $R_f$=100 kΩ, $C_f$=1 nF, determine the lower frequency limit of integration and show the response for the inputs (1) Step input (2) Square input (3) Sine input   | C206.2 | 1,2,3 |
| Q.2.2 | Design an adder-subtractor circuit for $V_o = 2V_1 + 5V_2 – 10V_3$. | C206.2 | 1,2,3,6,12 |
| Q.2.3 | For a V-I converter shown in following figure, $V_{in}$ = 5V, R = 10kΩ, $V_1$ = 1V, find the load current and output voltage $V_0$. Assume thatthe op-amp is initially nulled.   | C206.2 | 1,2,3 |

| | | | |
|---|---|---|---|
| Q.2.4 | For a maximum frequency of 100Hz, design a differentiator circuit and draw the frequency response for the same. | C206.2 | 1,2,3,6,12 |
| Q.2.5 | Design an op-amp circuit to give an output voltage $V_0 = 4V_1 – 3V_2 + 5V_3 – V_4$ where $V_1$, $V_2$, $V_3$ and $V_4$ are inputs. | C206.2 | 1,2,3,6,12 |
| Q.2.6 | Explain voltage to current converter using operational amplifier. Also explain the application of OP-AMP as integrator. | C206.2 | 1 |
| Q.2.7 | Explain in detail about the stability criteria and different methods of frequency compensation techniques used in operational amplifiers. | C206.2 | 1 |
| Q.2.8 | Define slew rate and explain how it can be improved. | C206.2 | 1,2,3 |
| Q.2.9 | Derive the expression forCMRR of differential amplifier with equivalent circuit and explain any one method to improve CMRR. | C206.2 | 1,2,3 |
| | **UNIT – III APPLICATIONS OF OP-AMP** | | |
| Q.3.1 | A dual slope ADC uses a 16-bit counter and a 4 MHz clock rate. The maximum input voltage is +10 V. The maximum integrator output voltage should be -8 V when the counter has cycled through $2^n$ counts. The capacitor used in the integrator is 0.1 µF. Determine the value of the resistor R of the integrator. | C206.3 | 1,2,3 |
| Q.3.2 | Derive the expression for the log and antilog amplifiers with necessary diagrams. | C206.3 | 1,2,3 |
| Q.3.3 | In a triangular wave generator, given $R_2 = 1.2k\Omega$, $R_3 = 6.8\ k\Omega$, $R_1 = 120k\Omega$, $C_1 = 0.01\mu F$. Determine the peak to peak output amplitude& frequency of triangular wave. | C206.3 | 1,2,3 |
| Q.3.4 | Design a RC phase shift oscillator for a frequency of 1 KHz. | C206.3 | 1,2,3,6,12 |
| Q.3.5 | Discuss the second order high pass filter with its frequency response and design the circuit with the cut-off frequency of 5KHz. | C206.3 | 1,2,3,6,12 |
| Q.3.6 | With a neat circuit diagram, explain the working of Schmitt trigger using op-amp. | C206.3 | 1 |
| Q.3.7 | Explain the working of Instrumentation amplifier. | C206.3 | 1 |
| Q.3.8 | With a neat circuit diagram, explain the operation of R-2R typeD/A converter. | C206.3 | 1 |
| Q.3.9 | Illustrate the working principle of dual slope type A/D converter. Discuss its advantages and limitations. | C206.3 | 1 |
| Q.3.10 | Explain the operation of peak detector and S/H circuit. Also state the advantages and applications of sample and hold circuits. | C206.3 | 1 |
| Q.3.11 | Differentiate a clipper and a clamper with neat sketches. | C206.3 | 1 |
| | **UNIT – IV SPECIAL ICs** | | |
| Q.4.1 | For the VCO circuit, assume $R_2 = 2.2\ K\Omega$, $R_1 = R_3 = 15\ K\Omega$ and $C_1 = 0.001\mu F$. Assume $V_\infty = 12V$. Determine the output frequency, the change in output frequency if modulating input $V_c$ is varied from 7V to 8V. | C206.4 | 1,2,3 |
| Q.4.2 | For a 555 astable circuit, determine the high state time interval, low state time interval, period, frequency and duty cycle. | C206.4 | 1,2,3 |
| Q.4.3 | With neat diagram, explain the operation of four quadrant variable transconductance multiplier circuit. | C206.4 | 1 |
| Q.4.4 | In the astable multivibrator using 555 timer, $R_A = 2.2K\Omega$, $R_B = 6.8K\Omega$ and $C = 0.01\mu F$. Calculate $t_{HIGH}$, $t_{LOW}$, free running frequency and Duty cycle. | C206.4 | 1,2,3 |
| Q.4.5 | Explain the working of a voltage controlled oscillator. | C206.4 | 1 |
| Q.4.6 | Explain how frequency multiplication is done using PLL. | C206.4 | 1 |
| Q.4.7 | With the help of neat diagram, explain the working of IC 555 as an astable multivibrator. | C206.4 | 1 |
| Q.4.8 | With block diagram discuss the principle of operation of NE565 PLL circuit. | C206.4 | 1 |
| Q.4.9 | Explain how PLL is used as an AM detector and frequency translator. | C206.4 | 1 |
| Q.4.10 | (i) Draw the functional block diagram &explain the characteristics of IC 555.<br>(ii) Write a short note on Analog multiplier. | C206.4 | 1 |
| | **UNIT – V APPLICATION ICs** | | |
| Q.5.1 | State the advantages of IC voltage regulator and explain the features and internal structure of general purpose Linear IC 723 regulator. | C206.5 | 1 |
| Q.5.2 | With a neat functional diagram, explain the operation of LM 380 power amplifier. | C206.5 | 1 |
| Q.5.3 | Explain the operation of SMPS with neat diagrams and also discuss its advantages | C206.5 | 1 |

| | | | |
|---|---|---|---|
| | and disadvantages. | | |
| Q.5.4 | With a neat diagram, explain the working of step down switching regulator. | C206.5 | 1 |
| Q.5.5 | Explain the working of series voltage regulator. | C206.5 | 1 |
| Q.5.6 | Explain the working principle of IC 8038 function generator. | C206.5 | 1 |
| Q.5.7 | What are IC voltage regulators? Explain the principle of operation of IC LM317 as a voltage regulator. | C206.5 | 1 |
| Q.5.8 | Explain Isolation Amplifiers and discuss the limitations of linear voltage regulators. | C206.5 | 1 |
| Q.5.9 | Design a regulator using IC 723 to meet the following specifications:<br>$V_0$ = 5V; $I_o$ = 100mA; $V_{in}$ = 15 ± 20%; $I_{sc}$ = 150 mA; $V_{sense}$ = 0.7V. | C206.5 | 1,2,3,6,12 |

**ASSIGNMENT QUESTIONS**

| S. No. | Questions | COs | POs |
|---|---|---|---|
| | **UNIT – I IC FABRICATION** | | |
| A.1.1 | Draw the cross-sectional view of the following circuit when fabricated by silicon planar technology.<br>  | C206.1 | 1,3,6,12 |
| A.1.2 | Design a 4 kΩ diffused resistor. | C206.1 | 1,2,3,6,12 |
| A.1.3 | Explain why inductors are difficult to fabricate in ICs. | C206.1 | 1,12 |
| A.1.4 | Discuss the various ways for reducing $V_T$ of a MOSFET. | C206.1 | 1,12 |
| A.1.5 | List the merits of integrated circuits over discrete circuits. | C206.1 | 1,12 |
| | **UNIT – II CHARACTERISTICS OF OP-AMP** | | |
| A.2.1 | Design an amplifier with a gain of +5 using one op-amp. | C206.2 | 1,2,3,6,12 |
| A.2.2 | A square wave of peak to peak amplitude of 500 mV has to be amplified to a peak-to-peak amplitude of 3 volts, with a rise time of 4 µs or less. Can a 741C op-amp be used? | C206.2 | 1,2,3,12 |
| A2.3 | Give the detailed procedure on how to measure the slew rate of the 741C op-amp. | C206.2 | 1,3 |
| A.2.4 | (a) Design an op-amp differentiator that will differentiate an input signal with $f_{max}$=100 Hz.<br>(b) Draw the output waveform for a sine wave of 1V peak at 100 Hz applied to the differentiator.<br>(c) Repeat part (b) for a square wave input. | C206.2 | 1,2,3,6,12 |
| A.2.5 | In the circuit shown below, the op-amps are ideal. Determine Vout. **[GATE 2013]**<br>  <br>**ANS: 8V** | C206.2 | 1,2,3 |
| | **UNIT – III APPLICATIONS OF OP-AMP** | | |
| A.3.1 | A dual slope ADC uses a 16-bit counter and a 4 MHz clock rate. The maximum input voltage is +10 V. The maximum integrator output voltage should be -8 V when the counter has cycled through $2^n$ counts. The capacitor used in the integrator is 0.1 µF. Determine the value of the resistor R of the integrator.<br>**ANS: R = 205 KΩ** | C206.3 | 1,2,3 |

| | | | |
|---|---|---|---|
| A.3.2 | A Schmitt trigger with the upper threshold level $V_{UT}$ = 0V and hysteresis width $V_H$ = 0.2V converts a 1 kHz sine wave of amplitude $4V_{pp}$ into a square wave. Calculate the time duration of the negative and positive portion of the output waveform. **ANS: $T_1$ = 0.516 ms, $T_2$ = 0.484 ms** | C206.3 | 1,2,3 |
| A.3.3 | List the applications of Instrumentation amplifier & Comparator. | C206.3 | 1,6,12 |
| A.3.4 | Consider a four bit D to A converter. The analog value corresponding to digital signals of values 0000 and 0001 are 0V and 0.0625V respectively. Determine the analog value (in Volts) corresponding to the digital signal 1111. **[GATE 2015]** **ANS: 0.9225** | C206.3 | 1,2,3 |

## SEMINAR TOPICS

### UNIT – II CHARACTERISTICS OF OPAMP

1. Voltage to current converter with floating load
2. Voltage to current converter with Grounded load
3. Applications of V-I converter
4. Current to voltage converter
5. Applications of I-V converter
6. Inverting Summer
7. Non inverting summer
8. Subtractor/Difference amplifier

### UNIT – IV SPECIAL ICs

1. Linear Ramp Generator using 555 Timer
2. Pulse Width modulation using 555 Timer
3. Missing Pulse Detector using 555 Timer
4. Square Wave generator using 555 timer
5. 555 Timer as Schmitt Trigger

## SELF-STUDY TOPICS

| S. No | UNIT | TOPIC | Books to be referred |
|---|---|---|---|
| 1 | II | Adder - Subtractor | Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV Edition, Pearson Education, 2003 / PHI. 2000. |
| 2 | III | Triangular Wave Generator | D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', IV Edition, New Age, 2003. |
| 3 | V | Advantages & Disadvantages of SMPS | David A.Bell, 'Op-amp & Linear ICs', Oxford, 2013. |

Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 72068**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third Semester

Mechanical Engineering

MA 6351 — TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to Mechanical Engineering (Sandwich)/Aeronautical Engineering/ Agriculture Engineering/Automobile Engineering/B.E. Biomedical Engineering/ B.E. Civil engineering/B.E. Computer Science and Engineering/Electrical and Electronics Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Geoinformatics Engineering/Industrial Engineering/Industrial Engineering and Management/Instrumentation and Control Engineering/Manufacturing Engineering/Marine Engineering/Materials Science and Engineering/Mechanical and Automation Engineering/Mechatronics Engineering/Medical Electronics Engineering/Petrochemical Engineering/ Production Engineering/Robotics and Automation Engineering/ Biotechnology/ Chemical Engineering/Chemical and Electrochemical Engineering/Food Technology/Information Technology/Petrochemical Technology/Petroleum Engineering/Plastic Technology/Polymer Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Form the partial differential equation by eliminating arbitrary function '$f$' from $z = e^{ay} f(x + by)$.

2. Solve $(D^3 - D^2D' - 8DD'^2 + 12D'^3)z = 0$.

3. State the sufficient condition for a function $f(x)$ to be expressed as a Fourier series.

4. If the Fourier series of the function $f(x) = x + x^2$, in the interval $(-\pi, \pi)$ is $\frac{\pi^2}{3} + \sum_{n=1}^{\infty}(-1)^n\left[\frac{4}{n^2}\cos nx - \frac{2}{n}\sin nx\right]$, then find the value of the infinite series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots$

5. Write all possible solutions of one dimensional heat equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$.

6. Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6e^{-3x}$.

7. If $F(s)$ is the Fourier transform of $f(x)$, prove that $F\{f(x-a)\} = e^{ias}F(s)$.

8. Find Fourier Sine transform of $\frac{1}{x}$.

9. Find the Z-transform of $a^n$.

10. State initial and final value theorems on Z-transforms.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Find the general solution of $(z^2 - 2yz - y^2)p + (xy + zx)q = xy - zx$. (8)

(ii) Find the general solution of $(D^2 + 2DD' + D'^2)z = x^2 y + e^{x-y}$. (8)

Or

(b) (i) Find the general solution of $z = px + qy + p^2 + pq + q^2$. (8)

(ii) Find the general solution of
$(D^2 - 3DD' + 2D'^2 + 2D - 2D')z = \sin(2x + y)$. (8)

12. (a) (i) Find the Fourier series of period $2\pi$ for the function $f(x) = x\cos x$ in $0 < x < 2\pi$. (8)

(ii) Find the Fourier series expansion for $y = f(x)$ up to second harmonic from the following data: (8)

| $x$: | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| $y$: | 9 | 18 | 24 | 28 | 26 | 20 |

Or

(b) (i) Find the Fourier half-range cosine series of
$f(x) = \begin{cases} x, & \text{in } 0 < x < 1 \\ 2 - x, & \text{in } 1 < x < 2 \end{cases}$. (8)

(ii) Find the complex form of the Fourier series of $f(x) = e^{-ax}$ in, $-l < x < l$. (8)

13. (a) A tightly stretched string of length $2l$ is fastened at $x=0$ and $x=2l$. The midpoint of the string is then taken to height '$b$' transversely and then released from rest in that position. Find the lateral displacement of the string. (16)

Or

(b) A rectangular plate with insulated surfaces is 20 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature while the other short edge $x=0$ is given by $u=\begin{cases}10y & \text{for } 0\le y\le 10\\ 10(20-y) & \text{for } 10\le y\le 20\end{cases}$ and the two long edges as well as the other short edge are kept at 0°c, find the steady state temperature distribution $u(x,y)$ in the plate. (16)

14. (a) Find the Fourier transform of $f(x)$ given by $f(x)=\begin{cases}1 & \text{for } |x|<2\\ 0 & \text{for } |x|>2\end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin x}{x}dx$ and $\int_0^\infty \left(\frac{\sin x}{x}\right)^2 dx$. (16)

Or

(b) (i) Find the Fourier cosine transform of $e^{-a^2x^2}$ for any $a>0$. (8)

(ii) Evaluate $\int_0^\infty \frac{dx}{(x^2+1)(x^2+4)}$ using Fourier transforms. (8)

15. (a) (i) Find Z-transform of $\frac{2n+3}{(n+1)(n+2)}$. (8)

(ii) Using Convolution theorem, find $Z^{-1}\left[\frac{8z^2}{(2z-1)(4z+1)}\right]$. (8)

Or

(b) (i) Find $Z^{-1}\left[\frac{4z^3}{(2z-1)^2(z-1)}\right]$, by the method of partial fractions. (8)

(ii) Using Z-transforms, solve the equation $y_{n+2}-7y_{n+1}+12y_n=2^n$, given that $y_0=y_1=0$. (8)

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Reg. No. | | | | | | | | | | | | |

# Question Paper Code : 80608

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016

Third Semester

Civil Engineering

MA 6351 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all branches except Environmental Engineering, Textile Chemistry, Textile Technology, Fashion Technology and Pharmaceutical Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the PDE of all spheres whose centers lie on the $x$-axis.
2. Find the complete integral of $\frac{z}{pq} = \frac{x}{q} + \frac{y}{p} + \sqrt{pq}$.
3. State the Dirichlet's conditions for a function $f(x)$ to be expanded as a Fourier series.
4. Expand $f(x) = 1$, in $(0, \pi)$ as a half-range sine series.
5. State the assumptions in deriving one-dimensional wave equation.
6. State the three possible solutions of the one-dimensional heat flow (unsteady state) equation.
7. State change of scale property on Fourier transforms.
8. Find the infinite Fourier sine transform of $f(x) = \frac{1}{x}$
9. State convolution theorem on Z-transform.
10. Find $Z\left[\frac{1}{n(n+1)}\right]$.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the partial differential equations of all planes which are at a constant distance 'k' units from the origin. (8)

(ii) Solve the Lagrange's equation $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$. (8)

Or

(b) (i) Form the PDE by eliminating the arbitrary functions '$f$' and '$\varphi$' from the relation $z = xf\left(\frac{y}{x}\right) + y\varphi(x)$. (8)

(ii) Solve $(D^2 + DD' - 6D'^2)z = y\cos x$. (8)

12. (a) (i) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$ and hence deduce that $1 + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \ldots = \frac{\pi^4}{90}$. (8)

(ii) Obtain the constant term and the coefficient of the first sine and cosine terms in the Fourier expansion of $y$ as given in the following table: (8)

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| $y$ | 9 | 18 | 24 | 28 | 26 | 20 |

Or

(b) (i) Expand $f(x)=e^{-ax}, -\pi<x<\pi$ as a complex form Fourier series. (8)

(ii) Expand $f(x)=\begin{cases} x, & 0<x<1 \\ 2-x, & 1<x<2 \end{cases}$ as a series of cosines in the interval (0,2). (8)

13. (a) A tightly stretched string of length $l$ with fixed end points is initially at rest in its equilibrium position. If it is set vibrating by giving each point a velocity $y_t(x,0)=v_0 \sin\left(\frac{3\pi x}{l}\right)\cos\left(\frac{\pi x}{l}\right)$, where $0<x<l$. Find the displacement of the string at a point, at a distance $x$ from one end at any instant '$t$'. (16)

Or

(b) A square plate is bounded by the lines $x=0, x=20, y=0, y=20$. Its faces are insulated. The temperature along the upper horizontal edge is given by $u(x,20)=x(20-x), 0<x<20$, while the other three edges are kept at 0°C. Find the steady state temperature distribution $u(x,y)$ in the plate. (16)

14. (a) (i) Find the Fourier transform of $f(x)=\begin{cases} 1-|x|, & |x|<1 \\ 0, & |x|>1 \end{cases}$ and hence deduce that $\int_0^\infty \left[\frac{\sin t}{t}\right]^4 dt=\frac{\pi}{3}$. (8)

(ii) Find the infinite Fourier sine transform of $f(x)=\frac{e^{-ax}}{x}$ hence deduce the infinite Fourier sine transform of $\frac{1}{x}$. (8)

Or

(b) (i) Find the infinite Fourier transform of $e^{-a^2x^2}$ hence deduce the infinite Fourier transform of $e^{-x^2/2}$. (8)

(ii) Solve the integral equation $\int_0^\infty f(x)\cos\lambda x\,dx=e^{-\lambda}$, where $\lambda>0$. (8)

15. (a) (i) Find
(1) $Z[n^3]$ (2) $Z[e^{-t}t^2]$. (4+4)

(ii) Evaluate $Z^{-1}\left[\frac{9z^3}{(3z-1)^2(z-2)}\right]$, using calculus of residues. (8)

Or

(b) (i) Using convolution theorem, evaluate $Z^{-1}\left[\frac{z^2}{(z-a)(z-b)}\right]$. (8)

(ii) Using Z-transform, solve $y_{n+2}+6y_{n+1}+9y_n=2^n$ given that $y_0=y_1=0$. (8)

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 71764**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third Semester

Electrical and Electronics Engineering

EE 6301 — DIGITAL LOGIC CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Reduce $a(b+bc')+ab'$.

2. Convert $143_{10}$ into its binary and binary coded decimal equivalent.

3. Write the *POS* form of the *SOP* expression $f(x,y,z) = x'yz + xyz' + xy'z$.

4. Design a Half Subtractor.

5. Give the characteristic equation and characteristic table of a T Flip Flop.

6. State the differences between Moore and Melay state machines.

7. What is a flow table? Give example.

8. State the difference between PROM, PAL and PLA.

9. Give the syntax for package declaration and package body in VHDL.

10. Write the VHDL code for a 2 × 1 multiplexer using behavioral modeling.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Design a odd-parity hamming code generator and detector for 4-bit data and explain their logic.

(ii) Convert $FACE_{16}$ into its binary, octal and decimal equivalent.

Or

(b) (i) With circuit schematic explain the working of a two-input TTL NAND gate.

(ii) Compare Totem Pole and open collector outputs.

12. (a) (i) Reduce the following minterms using Karnaugh – Map
$f(w,x,y,z) = \sum m\,(0, 1, 3, 5, 6, 7, 8, 12, 14) + \sum d(9, 15)$. (7)

(ii) Implement the following function using a suitable multiplexer
$f(a,b,c) = \sum m\,(3, 7, 4, 5)$. (6)

Or

(b) (i) Design a 3 × 8 decoder and explain its operation as a minterm generator. (7)

(ii) Design a full adder using only NOR gates. (6)

13. (a) (i) Draw and explain the operation of a Master – Slave JK Flip Flop. (7)

(ii) Design a 5-bit ring counter and mention its applications. (6)

Or

(b) (i) Design a 4-bit parallel-in serial-out shift register using D Flip Flops. (7)

(ii) Using partitioning minimization procedure reduce the following state table : (6)

| Present state | Next state | | Output |
|---|---|---|---|
| | $w = 0$ | $w = 1$ | Z |
| A | B | C | 1 |
| B | D | F | 1 |
| C | F | E | 0 |
| D | B | G | 1 |
| E | F | C | 0 |
| F | E | D | 0 |
| G | F | G | 0 |

14. (a) A control mechanism for a vending machine accepts nickels and dimes. It dispense merchandise when 20 cents is deposited ; it does not give change if 25 cents is deposited. Design the FSM that implements the required control, using as few states as possible. Find a suitable assignment and derive next-state and output expressions. (13)

Or

(b) (i) Implement the following logic and analyse for the pressure of any hazard $f = x_1x_2 + \overline{x}_1x_3$. If hazard is present briefly explain the type of hazard and design a hazard-free circuit. (7)

(ii) Implement the following functions using programmable logic array :

$f_1(x, y, z) = \sum m(0, 1, 3, 5, 7)$

$f_2(x, y, z) = \sum m(2, 4, 6)$. (6)

15. (a) Design a 3 –bit magnitude comparator and write the VHDL code to realize it using structural modeling. (13)

Or

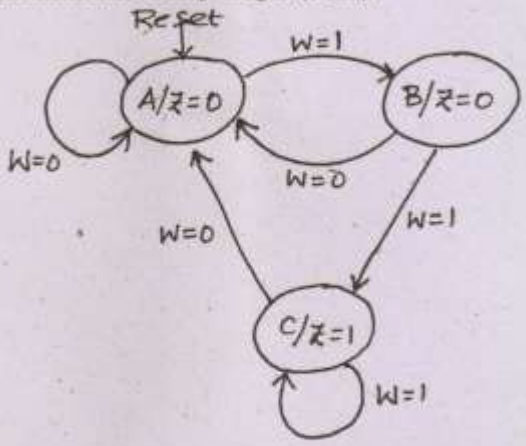
(b) Design a 4 × 4 array multiplier and write the VHDL code to realize it using structural modeling. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design a CMOS inverter and explain its operation. Comment on its characteristics such as Fan-in, Fan-out power dissipation, propagation delay and noise margin. Compare its advantages over other logic families. (15)

Or

(b) Write the VHDL code for the given state diagram, using behavioral modeling. Design it using one-hot state assignment and implement it using Programmable Array Logic (PAL). (15)



Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 80366

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Electrical and Electronics Engineering

EE 6301 — DIGITAL LOGIC CIRCUITS

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Construct OR gate and AND gate using NAND gates.
2. Convert the following Excess - 3 numbers into decimal numbers.
   (a) 1011
   (b) 1001 0011 0111
3. Convert the given expression in canonical SOP form
   $Y = AB + A'C + BC'$
4. Draw the truth table of 2 :1 MUX.
5. Differentiate Mealy and Moore model.
6. Draw the state diagram of JK flip flop.
7. What is static hazard and dynamic hazard?
8. Define races in asynchronous sequential circuits.
9. Write VHDL behavioral model for D flip flop.
10. Write the VHDL code for a logical gate which gives high output only when both the inputs are high.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain with an aid of circuit diagram the operation of 2 input CMOS NAND gate and list out its advantages over other logic families. (10)

    (ii) Given the two binary numbers $X = 1010100$ and $Y = 1000011$, perform the subtraction $Y - X$ by using 2's complements. (3)

    Or

    (b) (i) Explain in detail the usage of Hamming codes for error detection and error correction with an example considering the data bits as 0101. (10)

    (ii) Convert $23.625_{10}$ to octal (base 8). (3)

12. (a) Simplify the logical expression using K-map in SOP and POS form $F(A,B,C,D) = \Sigma m(0,2,3,6,7) + d(8,10,11,15)$. (13)

Or

(b) Design a full subtractor and realise using logic gates. Also, implement the same using half subtractors (13)

13. (a) Design a sequence detector that produces an output '1' whenever the non-overlapping sequence 101101 is detected. (13)

Or

(b) (i) Explain the realization of JK flip flop from T flip flop. (7)

(ii) Write short notes on SIPO and draw the output waveforms. (6)

14. (a) Design an asynchronous circuit that has two inputs $x1$ and $x2$ and one output $z$. The circuit is required to give an output whenever the input sequence (0,0), (0,1) and (1, 1) received but only in that order (13)

Or

(b) (i) Design a PLA structure using AND and OR logic for the following functions. (10)

$F1 = \Sigma m(0, 1, 2, 3, 4, 7, 8, 11, 12, 15)$

$F2 = \Sigma m(2,3,6,7,8,9,12,13)$

$F3 = \Sigma m(1,3,7,8,11,12,15)$

$F4 = \Sigma m(0,1,4,8,11,12,15)$

(ii) Compare PLA and PAL circuits. (3)

15. (a) Explain in detail the concept of structural modeling in VHDL with an example of full adder. (13)

Or

(b) (i) Write short notes on built- in operators used in VHDL programming. (6)

(ii) Write VHDL coding for 4 × 1 Multiplexer. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Assume that there is a parking area in a shop whose capacity is 10. No more than 10 cars are allowed inside the parking area and the gate is closed as soon as the capacity is reached. There is a gate sensor to detect the entry of car which is to be synchronized with the clock pulse. Design and implement a suitable counter using JK flip flops. Also, determine the number of flip flops to be used if the capacity is increased to 50. (15)

Or

(b) Design a 4 bit code converter which converts given binary code into a code in which the adjacent number differs by only 1 by the preceding number. Also, develop VHDL coding for the above mentioned code converter. (15)

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 71765**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third Semester

Electrical and Electronics Engineering

EE 6302 — ELECTROMAGNETIC THEORY

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the sources of electromagnetic fields?
2. State Stoke's theorem.
3. The electric potential near the origin of a system of co-ordinates is $V = 5x^2 + 8y^2 + 10z^2$. Find the electric field at (1,2,3).
4. What is a conservative field?
5. What is vector magnetic potential?
6. Define Biot-Savart's law.
7. Find the emf induced in a conductor of length 1m moving with a velocity of 100 m/s perpendicular to a field of 1 Tesla.
8. Differentiate transformer and motional emf.
9. Find the velocity of a plane wave in a lossless medium having a relative permitivity 2 and relative permeability of unity.
10. What is skin depth?

PART B — (5 × 13 = 65 marks)

11. (a) (i) State and prove Gauss divergence theorem. (6)

(ii) Derive an expression for electric field intensity due to infinite line charge using Coulomb's law. (7)

Or

(b) Evaluate D and E in all regions for a concentric spherical shell containing charge Q on it. Assume the charge distributions are infinite in extent. (13)

12. (a) (i) Derive the electric potential due an uniformly charged infinite line with uniform charge distribution. (8)

(ii) Obtain the electric potential due to electric dipole. (5)

Or

(b) (i) Derive the electrostatic boundary conditions. (8)

(ii) Derive the expression for capacitance of a parallel plate capacitor. (5)

13. (a) (i) Obtain an expression for the magnetic field intensity due to straight finite conductor carrying current I amperes using Biot Savart's law. (8)

(ii) State and prove Ampere's law. (5)

Or

(b) (i) State and prove magnetic boundary conditions. (7)

(ii) Find the torque about y-axis for the two conductors of length 'l' carrying current in opposite directions separated by a fixed distance 'w' in an uniform magnetic field in x-direction. (6)

14. (a) Derive the Maxwell's equations both in integral and point forms. (13)

Or

(b) (i) Explain the relation between field theory and circuit theory in detail. (6)

(ii) A circular loop conductor having a radius of 0.15m is placed in X-Y plane. This loop consists of a resistance of $20\,\Omega$. If the magnetic flux density is $B = 0.5 \sin 10^3 \bar{a}_x$ Tesla, Find the current through the loop. (7)

15. (a) Deduce the equation of the propagation of the plane electromagnetic waves in free space. (13)

Or

(b) State and prove Poynting theorem. (13)

PART C — ($1 \times 15 = 15$ marks)

16. (a) Given that $D = 5r^2/4\,\bar{a}_r\ C/m^2$. Evaluate both the sides of divergence theorem for the volume enclosed by $r = 4m$ and $\theta = \pi/4$. (15)

Or

(b) A free space – silver interface has E (incident) = 100 V/m on the free space side. The frequency is 15 MHz and the silver constants are $\varepsilon_r - \mu_r = 1, \sigma = 61.7$ MS/m. Determine E (reflected) and E (transmitted) at the interface. (15)

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Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 80367

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Electrical and Electronics Engineering

EE 6302 — ELECTROMAGNETIC THEORY

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the angle between $A = 2\vec{a}_x + 4\vec{a}_y$ and $B = 6\vec{a}_y - 4\vec{a}_z$.
2. State Stoke's Theorem.
3. Find the capacitance of an isolated spherical shell of radius $a$.
4. Find the magnitude of D for a dielectric material in which $E = 0.15$ MV/m and $\varepsilon_r = 5.25$.
5. State Ampere's Circuital Law.
6. A conductor 4 m long lies along the $y$-axis with the current of 10 A in $a_y$ direction, if the field is $B = 0.05\,a_x$ Tesla calculate the force on the conductor.
7. Moist soil has conductivity of $10^{-3}$ S/m and $\varepsilon_r = 2.5$, determine the displacement current density if $E = 6.0 \times 10^{-6}\ sin\ 9.0 \times 10^9$ t $(V/m)$.
8. State Faraday's Law.
9. Define standing wave ratio.
10. State the properties of uniform plane wave.

PART B — (5 × 13 = 65 marks)

11. (a) (i) State and Prove Divergence theorem (8)

(ii) Transform $4\vec{a}_x - 2\vec{a}_y - 4\vec{a}_z$ at (2, 3, 5) to cylindrical coordinates. (5)

Or

(b) (i) Derive the expression for electric field intensity due to uniformly charged circular disc of $\sigma$ c/m$^2$. (8)

(ii) Find the force on a charge $Q_1$ of 20 $\mu C$ at (0, 1, 2)m due to $Q_2$ of 300 $\mu C$ at (2, 0, 0)m. (5)

12. (a) (i) Find the potential at $r_A = 5$ m with respect to $r_B = 15$ m due to point charge $Q = 500$ pC at the origin and zero reference at infinity. (6)

(ii) Find the capacitance of a parallel plate capacitor with dielectric $\varepsilon_{r1} = 1.5$ and $\varepsilon_{r2} = 3.5$ each occupy one half of the space between the plates of area 2 m$^2$ and $d = 10^{-3}$ m. (7)

Or

(b) (i) In spherical coordinates $V = -25$ V on a conductor at $r = 2$ cm and $V = 150$ V at $r = 35$ cm. The Space between the conductor is a dielectric of $\varepsilon_r = 3.12$. Find the surface charge densities on the conductor. (10)

(ii) Define Laplace and Poisson's equation. (3)

13. (a) Derive the expression for magnetic field intensity due to infinitely long straight conductor carrying a current of I amps along Z-axis. (13)

Or

(b) (i) Determine H for a solid cylindrical conductor of radius a, where the current I is uniformly distributed over the cross section. (5)

(ii) Calculate the inductance of a ring shaped coil of mean diameter 20 cm, wound on a wooden core of 2 cm diameter containing 200 turns. (8)

14. (a) Derive Maxwell's equation in both point and integral form for conducting medium and free Space. (13)

Or

(b) (i) Explain the concept of emf induction in static and time varying magnetic field. (8)

(ii) In a material for which $\sigma = 5.0$ S/m and $\varepsilon_r = 1$ with $E = 250 \sin 10^{10}$ t (V/m). Find $J_c$ and $J_D$ and also the frequency at which they equal magnitudes. (5)

15. (a) Derive the expression for electromagnetic wave equation for conducting and perfect dielectric medium. (13)

Or

(b) A 6580 MHz uniform plane wave is propagating in a material medium of $\varepsilon_r = 2.25$. If the amplitude of the electric field intensity of lossless medium is 500 V/m. Calculate the phase constant, propagation constant, velocity, wavelength and intrinsic impedance. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A plane wave travelling in $+z$ direction in free space ($z < 0$) is normally incident at $z = 0$ on a conductor ($z > 0$) for which $\sigma = 61.7$ MS/m, $\mu_r = 1$. The free space $E$ wave has a frequency f = 1.5 MHZ and an amplitude of 1.0 V/m at the interface it is given by $E(0, t) = 1.0 \sin 2\pi ft\, a_y$ (V/m). Analyse the wave and predict magnetic wave $H(z, t)$ at $z > 0$. (15)

Or

(b) Given that $A = 30e^{-r}\vec{a}_r - 2z\vec{a}_z$ in cylindrical coordinates, evaluate both sides of divergence theorem for the volume enclosed by $r = 2$, $z = 0$ and $z = 5$. (15)

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 71947**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third/Fourth/Fifth/Sixth/Seventh/Eighth Semester

Mechanical Engineering

GE 6351 – ENVIRONMENTAL SCIENCE AND ENGINEERING

(Common to Aeronautical Engineering, Agriculture Engineering, Automobile Engineering, Biomedical Engineering, Civil Engineering, Computer Science and Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Environmental Engineering, Geoinformatics Engineering, Industrial Engineering, Industrial Engineering and Management, Instrumentation and Control Engineering, Manufacturing Engineering, Marine Engineering, Materials Science and Engineering, Mechanical and Automation Engineering, Mechatronics Engineering, Medical Electronics Engineering, Petrochemical Engineering, Production Engineering, Robotics and Automation Engineering, Bio technology, Chemical Engineering, Chemical and Electrochemical Engineering, Fashion Technology, Food Technology, Handloom and Textile Technology, Information Technology, Petrochemical Technology, Petroleum Engineering, Pharmaceutical Technology, Plastic Technology, Polymer Technology, Textile Chemistry, Textile Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you understand by 'species biodiversity'? Give one example.
2. How is nitrogen fixed in soil?
3. What are the characteristics of PAN?
4. Mention the effects of nuclear wastes in humans.
5. Give any two reasons for marine pollution.
6. Write any two problems caused by high saline soils.

7. How is cyclone formed?

8. When does rehabilitation arise? Mention any one problem to government during rehabilitation.

9. What is meant by value education?

10. Mention any two welfare programs for children adopted in India.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the structure and function of grassland eco system. (6)

(ii) Substantiate the statement, 'India is a megadiversity nation'. (7)

Or

(b) (i) Write the importance of biological hazard in the environment. (6)

(ii) Explain the methods of conservation of biodiversity. (7)

12. (a) (i) How is noise pollution controlled? (6)

(ii) Write a detailed note on photo chemical reactions taking place in the atmosphere. (7)

Or

(b) (i) What are the effects of heavy metals in aquatic environment. (6)

(ii) What is a particulate matter? How is it controlled by using equipment? (7)

13. (a) (i) What are the reasons of deforestation? (6)

(ii) How is biogas generated? (7)

Or

(b) Explain in detail the effect of modern agriculture which includes both beneficial and adverse effects. (13)

14. (a) What is green chemistry? Explain the various principles of green chemistry with suitable examples. (13)

Or

(b) Explain the features of the following :

(i) Air Act

(ii) Forest conservation Act. (13)

15. (a) Describe the following : (13)

(i) Environment and human health relation.

(ii) HIV and AIDS.

Or

(b) What do you mean by environmental impact analysis? What are the methods followed for EIA? (13)

PART C — (1 × 15 = 15 marks)

16. (a) Enlist the rules of management and handling biomedical waste and analyse critically the problems associated with the implementation.

Or

(b) Analyse the environmental effects of extracting and using mineral resources and write the remedies taken.

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 80507**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Civil Engineering

GE 6351 — ENVIRONMENTAL SCIENCE AND ENGINEERING

(Common to Third Semester Computer Science and Engineering, Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Environmental Engineering, Robotics and Automation Engineering, Information Technology, Polymer Technology, Textile Chemistry, Textile Technology, Fashion Technology, Biotechnology, Plastic Technology, Pharmaceutical Technology and Petrochemical Technology)

(Also common to Fourth Semester Agriculture Engineering, Geoinformatics Engineering, Mechanical Engineering and Chemical Engineering and Medical Electronics)

(Also common to Fifth Semester Electronics and Communication Engineering, Mechatronics Engineering, Automobile Engineering, Aeronautical Engineering, Production Engineering, Mechanical and Automation Engineering, Petrochemical Engineering, Petroleum Engineering)

(Common to Sixth Semester Biomedical Engineering and Materials Science and Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define ecosystem diversity.
2. Write about any two chemical hazards present in the environment.
3. Mention the measures to control thermal pollution caused by industries.
4. List any four water quality parameters and their importance.
5. What is Biogas? Mention its uses.
6. Define Sustainable lifestyle.
7. Write any four principles of green chemistry.

8. What is consumerism? How does it affect the environment?

9. Define EIA and its benefits.

10. What are the objectives of Women Welfare systems?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the function of an ecosystem using energy flow and material cycling. (7)

(ii) Define In-situ and Ex-situ conservation of biodiversity and explain. (6)

Or

(b) (i) Explain the stages in ecological succession using appropriate terminology. (7)

(ii) Justify India to be a mega biodiversity nation with the required data. (6)

12. (a) (i) Discuss about the causes, impacts and control measures of ozone depletion in the atmosphere. (7)

(ii) Write a flow sheet and explain the steps involved in Solid Waste Management. (6)

Or

(b) (i) Mention any four air pollutants with their sources and emission control measures. (7)

(ii) What are the effects of Marine pollution? (6)

13. (a) (i) Explain the stages in desertification. (7)

(ii) What is over utilisation of water resources? Mention the remedial measures. (6)

Or

(b) (i) Write a note on (1) use of fertilizers and pesticides (2) soil salinity problems. (7)

(ii) List the impact of deforestation on the environment. (6)

14. (a) (i) What is cyclone? Describe cyclone management using fore casting. (7)

(ii) What is Ecomark? Explain. (6)

Or

(b) (i) Describe about The Air Act 1981. (7)

(ii) Name any three significant biomedical wastes and their safe disposal. (6)

Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 71723**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Second/Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Biomedical Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Medical Electronics Engineering, Robotics and Automation Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between zener breakdown and avalanche breakdown.
2. Mention some of the applications of laser diode.
3. Draw the two transistor equivalent circuit of SCR.
4. A transistor has a typical $\beta$ of 100. If the collector current is 40 mA, what is the value of emitter current?
5. A common emitter amplifier has an input resistance 2.5 $k\Omega$ and voltage gain of 200. If the input signal voltage is 5mV. Find the base current of the amplifier.
6. Define an intrinsic stand off ratio of UJT and draw its equivalent circuit.
7. Compare the performances of CE and CC configuration.
8. Define a common mode rejection ratio for a differential amplifier. What is the value of CMRR for ideal cases?
9. A tuned circuit has a resonant frequency of 1600 kHz and a bandwidth of 10 kHz. What is the value of its Q factor?
10. Give the two Barkhausen conditions required for sinusoidal oscillation to be sustained.

PART B — (5 × 13 = 65 marks)

11. (a) Draw the circuit diagram and explain the working of full wave bridge rectifier with output filter and derive the expression of average output current and ripple factor. (13)

Or

(b) (i) Drive the expression for diffusion capacitance of PN junction diode. (7)

(ii) Explain how zener diode can be acts as a voltage regulator. (6)

12. (a) (i) Explain the drain and transfer characteristics of Enhancement type MOSFET. (7)

(ii) Describe the working of Silicon controlled rectifier with neat diagram. (6)

Or

(b) (i) Describe the construction and working of IGBT with neat diagram. (7)

(ii) Sketch and explain the typical shape of drain characteristics of JFET for $V_{GS} = 0$ with indication of four region clearly. (6)

13. (a) Draw the circuit diagram of a common drain MOSFET amplifier. Derive the expression for its voltage gain, input resistance and output resistance. (13)

Or

(b) Figure 13(b) shows a common-emitter amplifier. Determine the input resistance, ac load resistance, voltage gain and output voltage. (13)

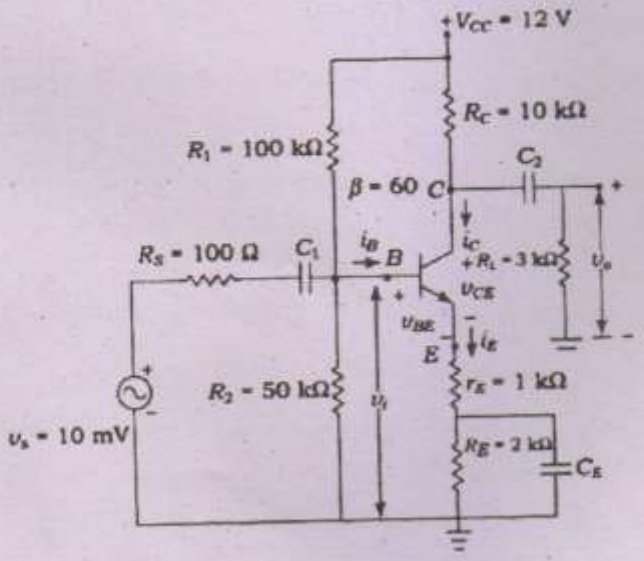


Figure 13(b)

14. (a) Draw the circuit diagram and explain the working of a differential amplifier using FET. Derive the expression for differential mode gain and common mode gain. (13)

Or

(b) Describe the working of class A and class C power amplifier in details with relevant diagrams. (13)

15. (a) With a neat block diagram, explain the operation of following feedback amplifiers.

(i) Voltage series feedback amplifier (7)

(ii) Current shunt feedback amplifier. (6)

Or

(b) Explain with neat circuit diagram, the working of Hartley oscillator using transistor. Derive an expression for frequency of oscillation. (13)

PART C — ($1 \times 15 = 15$ marks)

16. (a) Design an oscillator to operate at a frequency of 10 kHz which gives an extremely pure sine wave output, good frequency stability and highly stabilized amplitude. Discuss the operation of this oscillator as an audio signal generators. (15)

Or

(b) Design a voltage divider bias circuit for transistor to establish the quiescent point at $V_{CE} = 12$ V, $I_C = 1.5$ mA, stability factor $S \leq 3$, $\beta = 50$, $V_{BE} = 0.7$ V, $V_{CC} = 22.5$ V and $R_C = 5.6\ k\Omega$. (15)

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 80331**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Robotics and Automation Engineering and Second Semester Biomedical Engineering, Medical Electronics)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State few applications of zener diode.
2. A silicon diode has a saturation current 7.5 $\mu$A at room temperature 300k. Find the saturation current at 400k.
3. Define Early effect.
4. Determine the base current for the CE transistor circuit if Ic = 80 mA and $\beta$ = 170.
5. State Miller's Theorem.
6. Draw the hybrid small signal model of CB configuration.
7. CMRR of an amplifier is 100 dB, calculate common mode gain, if the differential gain is 1000.
8. Define conversion efficiency of power amplifier.
9. Differentiate oscillator and amplifier.
10. State the Barkhausen criterion for an oscillator.

PART B — (5 × 13 = 65 marks)

11. (a) Derive the expression of the Space charge or Transition capacitance of PN diode under reverse bias with a neat diagram. (13)

Or

(b) Explain the operation of a Half wave rectifier and derive its various parameters. (13)

12. (a) Draw and explain the working of SCR and its V-I characteristics. (13)

Or

(b) Describe the operation of UJT as a relaxation oscillator and derive its frequency of oscillation. (13)

13. (a) Determine the input impedance, output impedance, voltage gain and current gain of CE amplifier using hybrid model.

Or

(b) Explain the Common Drain MOSFET amplifier and derive its input impedance, output impedance and voltage gain. (13)

14. (a) Explain the common mode and differential mode analysis of differential amplifier and derive its CMRR. (13)

Or

(b) What is Neutralization? Explain any two methods of Neutralization. (13)

15. (a) Briefly explain Voltage – series feedback amplifier with neat diagram and derive an expression for input and output resistance. (13)

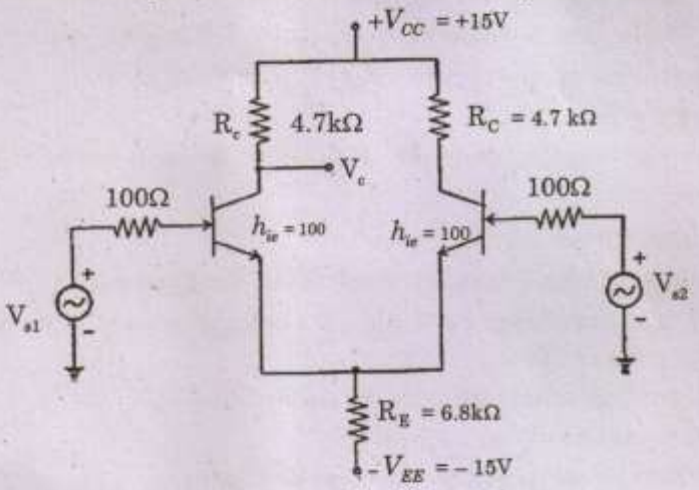
Or

(b) With neat diagram explain Wien - Bridge Oscillator and derive an expression for frequency of oscillation. (13)

PART C — (1 × 15 = 15 marks)

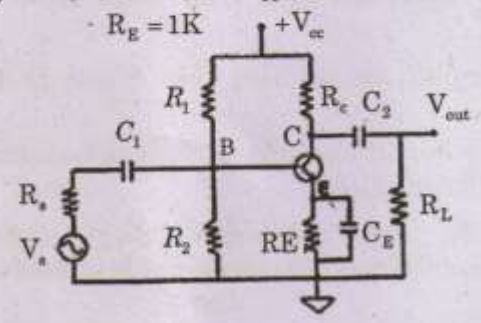
16. (a) (i) Design a RC phase shift oscillator to generate 5 kHz sine wave with 20 V peak to peak amplitude. Assume hfe = $\beta$ = 150, C =1.5nF, hre =1.2 k$\Omega$. (5)

(ii) Evaluate the (1) operating point (2) differential gain (3) common mode gain (4) CMRR and (5) output voltage if $V_{S1}$ = 70 mV peak to peak at 1 kHz and $V_{S2}$ = 40 mV peak to peak at 1 kHz of dual input balanced output differential Amplifier, $h_{ie} = 2.8K\Omega$. (10)




Or

(b) Evaluate the $A_i, A_v, R_i, R_o, A_{is}, A_{vs}$ of a single stage CE amplifier with $R_s = 1k\Omega$, $R_1 = 22k\Omega$, $R_2 = 10\,k\Omega$, $R_C = 2k\Omega$, $R_L = 2k\Omega$, $h_{fe} = 50$, hie = $1.1k\Omega$, $h_{oe} = 25\mu\,A/V$ and $h_{re} = 2.5*10-4$. (15)



Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 71766

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third Semester

Electrical and Electronics Engineering

EE 6303 — LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

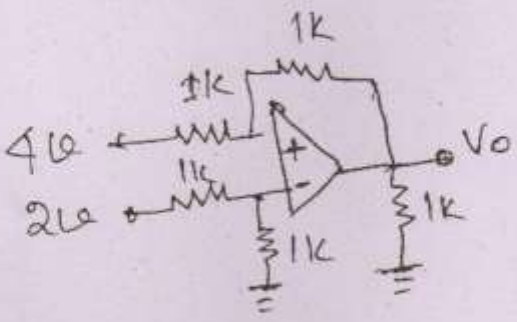
PART A — (10 × 2 = 20 marks)

1. State the advantages of CMOS circuits.

2. What is lithography?

3. Draw the circuit diagram of a symmetrical emitter coupled differential amplifier.

4. For the circuit diagram shown below determine the output voltage $V_0$.




5. Draw the circuit diagram of a zero cross detector with input and output waveforms.

6. Which is the fastest ADC? State reason.

7. What is an analog multiplier? Name its applications.

8. Draw the circuit diagram of a PLL circuit used as an AM modulator.

9. Give one comparison for switching regulator and variable voltage regulator.

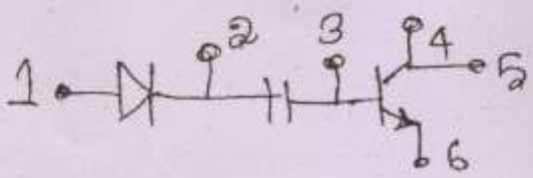
10. How are frequency of triangular waveform, obtained using ICL 8038 function generator?

PART B — (5 × 13 = 65 marks)

11. (a) With neat illustrations explain the various steps involved in the IC fabrication process. (13)

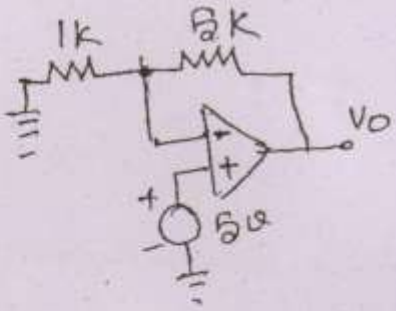
Or

(b) With circuit diagram explain the steps involved in the fabrication of the circuit shown below using IC technology. (13)

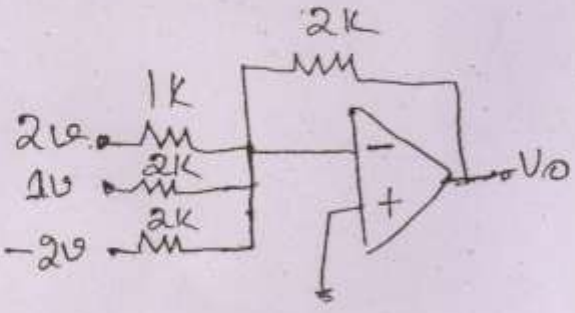



12. (a) Determine the output voltage for the following circuits. (6.5)

(i)




(ii)




(6.5)

Or

(b) (i) With diagram explain the working principle of V/I converter. (5)

(ii) Write a note on stability criterion and compensation techniques applicable to opamp circuit. (8)

13. (a) With diagram explain the following applications of op amp. (13)

(i) Clippers and clampers

(ii) Triangular waveform generator.

Or

(b) (i) Explain the working principle of R-2R ladder type D/A converter. (7)

(ii) Design a second, order Butterworth low pass filter with cut off frequency 2KHZ. (6)

14. (a) Briefly explain the functional block diagram of NE 565 PLL–IC to operate as a frequency divider. (13)

Or

(b) (i) Explain the functional block diagram of 555 timer IC. (8)

(ii) Design a monostable multivibrator with pulse duration of 1m sec using 555 timer IC. (5)

15. (a) With necessary diagram and waveforms explain the working principle of switched mode power supply. (13)

Or

(b) Write short notes on the following :

(i) LM 380 power amplifier

(ii) ICL 8038 function generator. (13)

PART C – (1 × 15 = 15 marks)

16. (a) Sketch the implementation of an instrumentation amplifier using three opamps. Explain the principle of operation and its applications. (15)

Or

(b) Using 7805 design a current source to deliver a 0.2A current to a 22 Ohm 10 w load. (15)

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Reg. No. : | | | | | | | | | | | | |

**Question Paper Code : 80368**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016

Third Semester

Electrical and Electronics Engineering

EE 6303 — LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the advantages of ICs over discrete circuits.
2. State the limitations of IC technology.
3. Write some applications of operational amplifier.
4. What is integrator?
5. Explain the sample and hold circuit.
6. Write the difference between active clipper and passive clipper circuit.
7. Draw the functional block of 555 timer IC.
8. Define PLL.
9. What is SMPS?
10. What are the applications of fixed voltage regulator?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe about epitaxial growth process. (6)

(ii) Explain in detail about the Photolithography process with neat diagram. (7)

Or

(b) Write a note on masking and etching process in IC fabrication. (13)

12. (a) Discuss in detail about the DC and AC characteristics of op amp. (13)

Or

(b) Explain the differential amplifier using op amp. (13)

13. (a) Write a note on logarithmic and antilog amplifier using op amp. (13)

Or

(b) Explain the working of SAR type and Flash type A/D converter. (13)

14. (a) With the help of schematic diagram, explain the operation of IC 566 VCO and derive its output frequency. (13)

Or

(b) What is PLL? How frequency multiplication is done in PLL? (13)

15. (a) What do you mean by the fixed voltage and variable voltage regulator. List its various applications. (13)

Or

(b) Write short notes on:

(i) LM380 Power Audio Amplifier. (6)

(ii) ICL 8038 Function Generator. (7)

PART C — (1 × 15 = 15 marks)

16. (a) What are the new trends in Integrated circuit technologies and explain about its scope for future generation?

Or

(b) Write a note on recent fabrication methods of FET for industrial applications.

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# ANNA UNIVERTISY, CHENNAI -25.

## OFFICE OF THE CONTROLLER OF EXAMINATIONS

### RULES OF THE EXAMINATIONS

A candidate is permitted to use geometric tools, non-programmable calculators and approved tables and data books only during the theory and the practical examinations. No other material/gadget (including cell phone) should be brought inside the examination hall.

A candidate should neither possess/refer any forbidden material in any form nor should seek/obtain assistance in any form from any person/source towards answering the questions during the examinations. He/she should not assist other candidates in any form towards answering the questions during the examinations. The candidate should not reveal his/her identity in any form in the answer scripts. The candidate should not indulge in canvassing either directly or indirectly to award more than deserving marks in the exanimations. The candidate should maintain discipline and decorum during the examinations.

Violation of the above rules in any form during the examinations will attract punishment ranging from levying fine to permanently debarring the candidate from continuing his/her studies as given below.

| Sl.No. | Nature of Malpractice | Maximum Punishment |
|---|---|---|
| 1 | Appeal by the candidate in the answer script to show mercy by way of awarding more than deserving marks. | Fine of Rs. 1000/- per subject. |
| 2 | The candidate writing his/her name in the answer script. | |
| 3 | The candidate writing his/her registration number/college name in places other than specified in the answer script | |
| | Any special marking in the answer script by the candidate. | |
| 4<br>5 | The candidate communicating with neighbouring candidate orally or non-verbally; the candidate causing suspicious movement of his/her body. | |
| 6 | Irrelevant writing by the candidate in the answer script. | |
| 7 | The candidate marking on the question paper or writing answer on his/her question paper or making use of his/her question paper for rough work | |
| 8 | The candidate possessing cell phones/programmable calculator(s)/any other electronic storage device(s) **gadgets** | Invalidating the examination of the particular subject written by the candidate |
| 9 | The Candidate facilitating the other candidate(s) to copy from his /her answer script | |
| 10 | The candidate possessing any incriminating material(s) (whether used or not). For example:-Written or printed materials, bits of papers containing written information, writings on scale, calculator, handkerchief, dress, part of the body, Hall Ticket, etc. | Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate. |
| 11 | The candidate possessing cell phone(s)/programmable calculator(s)/any other electronic storage device(s) **gadgets** and containing incriminating materials | |

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|---|---|---|
| | (whether used or not). | Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects.<br><br>If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate. |
| 12 | The Candidate possessing the question paper of another candidate with additional writing on it. | |
| 13 | The candidate passing his/her question paper to another candidate with additional writing on it | |
| 14 | The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s). | |
| 15 | The candidate copying from neighbouring candidate. | |
| 16 | The candidate taking out of the examination hall answer booklet(s), used or unused | |
| 17 | Appeal by the candidate in the answer script coupled with a promise of any form of consideration. | |
| 18 | Candidate destroying evidence relating to an alleged irregularity. | Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate.<br>Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects.<br>If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.<br>**Additional Punishment:**<br>1. if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period.<br>2. if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters. |
| 19 | Vulgar/offensive writings by the candidate in the answer script. | Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate. |
| 20 | The candidate possessing the answering script of another candidate | |
| 21 | The candidate passing his /her answer script to another candidate | |
| 22 | Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times. | Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.<br>**Additional Punishment:**<br>(i) If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period.<br>(ii) If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for two subsequent semesters. |
| 23 | The candidate substituting an answer book let prepared outside the examination hall for the one already distributed to the candidate | |
| 24 | The candidate indulge in any disruptive conduct including, but not limited to, shouting, assault of invigilator, officials or students using abusive and /or threatening language, destruction of property. | Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.<br>**Additional Punishment:**<br>(i) if the candidate has not completed the programme, he/she is debarred from continuing his/her studies for **two years** i.e., for four subsequent semesters. However the |
| 25 | The candidate harass or engage others to harass on his/her behalf an invigilator, official, witnesses or any other person in relation to an | |

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| | irregularity by making telephone calls, visits, mails or by any other means. | student is permitted to appear for the examination in all the arrears-subjects up to the last semester during the debarred period. (ii) if the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for four subsequent semesters. |
| 26 | Candidate possessing any firearm/weapon inside the examination hall. | |
| 27 | Cases of Impersonation | (i)Handing over the impersonator to the police with a complaint to take appropriate action against the person involved in the impersonation by the Chief Supt.<br><br>(ii)If a student of this University is found to impersonate a 'bonafide student', the impersonating student is debarred from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any programme of the University.<br><br>(iii)Debarring the 'bonafide student' for whom the impersonation was done from continuing his/her studies and writing the examinations **permanently.** He/she is not eligible for any further admission to any programme of the University. |

**CONTROLLER OF EXAMINATIONS**

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM 630612**

**(11 km from Madurai City)**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## STUDENTS LEAVE APPLICATION FORM

**Date:**

**Name of the Student :**

**Roll No. :** **Sem / Sec. :**

**Details of leave availing (b) / applied (a) :**

**Date & Day (a) :** **No. of. Days (a):**

**Reason for Leave :**

**No. of days, leave & OD, already availed (b):** **Total. No. of. Days (a+b):**

**% of Attendance as on : _____ is _____**

**Signature of the Student**

**Signature of Parent / Guardian**

**Name :**

**Mobile No. :**

**Recommended / Not Recommended**

**Class Coordinator** **HOD/EEE**

**K.L.N. COLLEGE OF ENGINEERING**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINERING**

**NORMS FOR ATTENDING WORKSHOP / SEMINAR/ TECHNICAL SYMPOSIUM/ CONFERENCE / TECHNICAL CONTEST etc.**

Students are regularly encouraged to attend skill development programmes such as workshop / seminar / Technical Symposium / Conference / Technical Contest etc., outside the college. This is to facilitate to improve their technical skills and competency. However, frequently attending such events, will reduce their academic performance, as they are not consistent in attending regular Theory / Practical classes. Also, it was reported that, few students were absent for class tests /CIT's and regular practical classes, in order to attend such skill development programmes. Hence, the following norms are framed, in order to balance the academic performance and facilitate the students to attend skill development programmes.

1. A student will be permitted, to attend skill development programme, not **more than three events per semester (6 days – OD- maximum).**
2. Academic performance of the students will be considered, before permitting a student to attend skill development programmes **(Upto 3 arrears, passed 4 subjects in Class test / CIT's – only will be permitted).**
3. Attendance of the student should **not be less than 90% as on date.**
4. No history of disciplinary action taken on the students**.**
5. Students will not be permitted during class test / Centralized Internal Test to attend Skill development programme. However students with high academic performance will be permitted, considering the nature of the event during class tests.
6. Students will be permitted to attend such events, only in the higher learning Institutions. (IITs, IISC, NITs, Anna University, MIT, NAAC accredited (A grade), Deemed Universities, NBA accredited, Government & Government Aided Institutions and Self financing Engineering Colleges).
7. Students are instructed to refer the academic calendar of the College, regularly so as to know the Internal test schedule and other events.
8. Students registering any events, without following above norms and not obtaining prior permission, **will not be granted ON DUTY and no RETEST** will be conducted. Necessary action will be taken against defaulters.
9. ON DUTY form is revised, accordingly, in order to incorporate all the above details.
10. Class co-ordinators / Academic Co-ordinators are instructed to recommend for OD, as per the above norms.

**HOD/EEE**

Cc to Principal for information

Cc to Staff & Students notice board,

Cc to file.

**K.L.N.COLLEGE OF ENGINEERING**

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

Format No.: F127

**ON DUTY REQUISITION FORM**

**STUDENTS – TO ATTEND SKILL DEVELOPMENT PROGRAMMES**

**(Workshop / Seminar / Symposium etc.)**

**Date: _____**

**To,**

**The Principal,**

**KLNCE.**

**Pottapalayam.**

**Respected Sir,**

**Sub.: Request for OD to attend _____**

**(Workshop / Conference / Value added course / Symposium / Project Contest / Seminar / Certificate Course / In-plant training / Internship)**

**As, I am going to attend _____ conducted by _____ _____ (Venue & Place) from_____ to_____. Please permit me to attend the programme and also grant me O.D. for these days.**

| S. No | Roll No. | Name & Degree, Semester / Section) | No. of Programmes already attended & Days OD availed | No. of Arrears in AU Exam | No. of subjects failed in Class Test | No. of Subjects failed in CIT's | ATT % As on | Sign |
|---|---|---|---|---|---|---|---|---|
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| | | | | | | | | |

**Discipline / misbehavior, reported if any :**

**Clash with Internal test if any :**

| Recommended by | | |
|---|---|---|
| Class co-ordinator | HOD | |
| | OD Permitted | OD Approved |
| | | |

## A BRIEF HISTORY OF THE COLLEGE

K.L.N. College of Engineering is the first self-financing Co-educational Engineering College in Madurai, started in 1994 by Munificence of Philanthropist and well wishers in Sourashtra Community which is a linguistic minority in Tamilnadu. This college is sponsored by the committee of eminent industrialists and academicians led by enthusiastic, educationalist and industrialist (Late) Thiru K.L.N. Krishnan. This college has the approval of All India Council for Technical Education, New Delhi and is affiliated to Anna University, Chennai.

Thiru. K.L.N. Krishnan, Founder President of this Engineering College has rendered Yeoman service to Sourashtra Arts & Science College and Sourashtra Girls Higher Secondary School, Madurai for the past several years. He also promited a Polytechnic under the name of K.L. Nagaswamy Memorial Polytechnic College in Viraganur, Madurai in 1983. This Engineering College, functioned in the premises of the above polytechnic during the academic years 1994-95 & 1995-96 was shifted to its own premises in the year 1996.

(Late) Thiru K.L.N. Krishnan is the Founder President, and the college is now under the management of Dr. K.N.K. Ganesh as Secretary & Correspondent and other executive committee members.

**Campus :**

This college is situated on the South Eastern outskirts of Madurai, 11th Km on Madurai – Nedungulam Road. It is built in an area of 53.8 acres. The Campus has multistoreyed buildings consisting of well provided class rooms, drawing halls, seminar halls, conference hall, library, Air-Conditioned Computer centres, staff rooms and student rest rooms. The infrastructure also consists of five double storeyed laboratory buildings and three single storeyed workshops and Machine shop, and an automobile workshop.

The Administrative block (2 storeyed) of 1,185 sq. metre with office in the ground floor, I.T. laboratory in the first floor & class rooms in the second floor has been constructed on the eastern side.

A two storeyed block of 1,185 sq. metre consisting class room has been constructed on the southern side of the administrative block.

A two storeyed block of 1,185 sq. metre with EIE laboratory in the ground floor, DSP laboratory in the first floor & class rooms in the second floor has been constructed on the western side of the administrative block.

A two storeyed block of 2,122 sq. metre with spacious library, video library & Electronic resource section in the ground floor, class rooms in the first floor & CSE laboratory in the second floor has been constructed near the administrative block.

A single storeyed block of 1,193 sq. metre with S.M. laboratory in the ground floor CAD, CAM laboratories in the first floor & class rooms in the second floor has been constructed on the north western side of the administrative block.

Three Mechanical sheds (occupied by three Mech. Engg. Laboratory) of 2460 sq. metre have been constructed on the northern side of the mechanical block. An automobile work shop of 2304 sq. metre has been constructed on the north western side of the administrative block.

An Indoor stadium cum Auditorium of 2,221 sq. metre has been constructed on the northern side of the administrative block.

A separate double storeyed post-Graduate block of 4,020 square metre for M.B.A. and M.C.A. departments has been constructed on the South Western side of the administrative Block.

A single storeyed block of two canteens with 2,485 square metre in the ground floor and ladies rest room in the first floor has been contructed on the south western side of the Administrative Block.

A single storeyed block of 1,289 square metre for Electrical & Electronics Engg., Laboratories & class rooms in the ground floor and Electronics & Communication Laboratory and Class rooms in the first floor has been constructed on the western side of the Administrative Block.

A two-storeyed block with an area of 2,956 sq. metre has been constructed as an extension to Block III Opposite the U.G. library Block. This block comprised Physics lab, Chemistry lab and EIE Lab. D.S.P. Lab & Class rooms.

A two-storeyed block with an area of 2076 squre metre for the use of EEE Dept. in the ground floor & ECE Dept. in the first & 2nd floors is now under construction as an extension to the existing EEE & ECE block on the western side of the administrative block.

A two storeyed block with an area of 2,977 sq. metre for the use of Mechanical & Automobile depts. is now under construction, as an extension to the existing Mechanical block on the North-Western side of the administrative block.

A separate building with ground floor of area of 170 sq. metre for the installation of Generator on the South-estern side (Opposite to the Vinayagar temple) of the administrative block is under construction & (nearing completion)

In order to facilitate the easy accessibility for the students, in all, 950 numbers of computers have been installed so far. This sounds the management's conviction in providing essential infrastructure for the learning purpose in our college.

An overhead Tank of 20,000 Litre Capacity at a height of 40 feet has been constructed at a cost of Rs.4 lakhs, donated by Rotary international, Rotary District-1240, Rotary club of LEIGH-ON-SEA. Treated drinking water plant at a cost of Rs.2 lakhs has been installed near the overhead tank.

Well-furnished Men's Hostel, Mess block and canteen block are also inside the campus. The college is a quiet retreat, ideal for concentrated study, away from distractions and disturbances of a large city.

A single storeyed block of 1,330 square metre with a spacious dining hall in the ground floor and 13 rooms in the first floor for men students has been constructed on the northern side of the administrative block and is already in use. A two storeyed hostel block of 2,034 square metre adjacent to the existing hostel for men students has been constructed.

Total expenditure incurred so far towards the cost of equipments & buildings & other assets is about Rs.22.50 crores.

A VINAYAGAR Temple on the eastern side of the administrative Block has been constructed Eight class rooms for I year B.E. / B.Tech 2 class room for M.E. (P.S.) students, and two staff rooms have been constructed in the ECE/EEE block.

A Ladies Hostel of 1460 sq.m. which can accommodate about 150 students in under construction within the campus.

## SALIENT FEATURES OF THE DEPARTMENT

### 1. GENERAL

- Started offering B.E. in Electrical and Electronics Engineering in the year 1994 with an intake of 40 (No.-732-50-8/RC/94, dated 11th August 1994, AICTE) with the latest intake of 120 in 2011 (F.No.Southern/1-400215781/2011/EOA, dated 01.09.2011, AICTE).
- Started offering M.E. in Power Systems Engineering in the year 2005 with an intake of 20 and increased intake to 24 in 2012 (F.No.Southern/1-687512981/2012/EOA, dated 10.05.2012, AICTE).
- Accredited in March 2004 (First time – F.No.NBA/ACCR-242/2003, dated 24/03/04) and Re-accredited (Second time – F.No.NBA/ACCR-242/2003, dated July 19, 2008) by National Board Accreditation, New Delhi. Re-accredited (Third time - For 2 years w.e.f. 28-08-2012) by National Board Accreditation, New Delhi. Re-accredited (Fourth time – For 3 years w.e.f. July 2016, upto 30.06.2019, F.No. 33-01/20100-NBA, dated 04.02.2017) by National Board Accreditation, New Delhi.
- Recognized Research Centre No.4490408, Approved by Anna University, Chennai with effect from December 2012, offering guidance for M.S & Ph.D.(Full time/Part time).
- Both UG and PG programs are permanently affiliated to Anna University, Chennai with effect from December 2012.
- MODROB fund of Rs.5 lakhs was allotted for the year 2011-2012 for the Power Electronics laboratory (No.8024/RIFD/MOD-131(pvt)/Policy-III/2011-2012, dated 06.03.2012).

### 2. INFRASTRUCTURE

- Electrical machines laboratory, Control, Measurement and Instrumentation laboratory, Power Electronics laboratory, Electric circuits and Electronic devices laboratory, Research and Development laboratory and Power System Simulation Laboratory are equipped with machineries, components, signal generating, power supply measuring, recording instruments and computer systems costing Rs.2 crores. The total built up area of laboratories is 1208.21 sq.m.
- Latest softwares on Power system analysis, Power system stability, Power world simulator and Power electronics are available to study, solve, design and simulate research on Power system and Power Electronics problems to experience the real time results.
- All the class rooms are equipped with computer systems, LCD and OHP to promote the Teaching-Learning process more effectively.
- Separate library facility for EEE students with more than two thousand books on core subjects and hard copies of IEEE Journals and magazines from 1999 are available for reference. Staff and students can access the softcopy of Journals, proceedings published by IEEE, Elsevier, ASME, Springer, Mc Graw Hill.
- All laboratories are provided with sufficient computing facilities, printing facility with internet connection to simulate laboratory experiments.

## 3. STAFF

- Teams of well qualified, and experienced 31 faculties with cadre ratio as per AICTE, are guiding the students to attain the best educational objectives.
- Excellent research environment promotes the staff and students to participate, present and publish their research works in the National/International Journals and National/International conferences.
- Facility and experienced faculty available for guiding Ph.D. scholars.
- Staff development Programme / Faculty development programme / Workshop/ Seminar are organized regularly to share the knowledge of our experienced faculty with parent institution and other colleges staff and students and Industrial persons.

## 4. RESEARCH AND DEVELOPMENT

- The Research and Development section is doing research on Industrial Power Harmonics and mitigation and interact with industries in measuring, recording, analyzing and designing of filters for reducing harmonics with the help of Power Quality analyzer, as per IEEE standard.

## 5. STUDENTS

- Students secured 95 University Ranks in UG and 15 University Ranks in PG from 1998 to 2015 with **Gold medal** in 2000 (UG - EEE) and in 2011 (PG – Power Systems Engineering). Sweety Jain of 2009 batch student secured 2nd rank in Anna University Examination in 2009 among 8500 students who completed degree and out of 240 Engineering colleges all over Tamil Nadu.
- IEEE student's chapter which was started in the year 1999, continuously conducting number of student technical programme. Guest lecturers from industries have been arranged periodically to promote Industry-Institute Interaction and to bridge the gap between curriculum and latest trend in industry.
- To promote innovation, latest trends in industry and employability skills, student's professional activities are conducted every year in the name of symposium and conferences.
- Workshop/Seminar is regularly conducted for students to meet out the curriculum objectives.
- Inplant trainings are arranged for second and third year students to have hands on training with industry. Industrial visits are arranged every semester to know about the various process taking places in industry.
- Placement oriented training programme were conducted every semester right from the first year to develop soft skills, attitude, aptitude, self confidence, communication skills, interview skills etc, so as to face the campus placement programme organized by the college. Professional Trainers from software companies, Bangalore, Chennai are being invited for such training programme.

**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM – 630 612**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**FACULTY LIST**

| S.No. | Name of the Faculty | Designation | Mobile No. | Email id |
|---|---|---|---|---|
| 1. | Dr.S.M.Kannan | Professor & Head | 9442035859 | smkeeeklnce@gmail.com |
| 2. | Dr.S.Venkatesan | Professor | 9790672188 | vensenn@yahoo.com |
| 3. | Dr.K.Gnanambal | Professor | - | gnans_balu@rediffmail.com |
| 4. | Dr. S.Parthasarathy | Professor | 9443402901 | sarathy_sps@yahoo.co.in |
| 5. | Dr. S.Venkatanarayanan | Professor | 9677320576 | venjey@yahoo.co.uk |
| 6. | A.Marimuthu | Associate Professor | 9865002712 | marimuthu_a@yahoo.com |
| 7. | P.Loganthurai | Associate Professor | 9952112115 | loganthurai@yahoo.co.in |
| 8. | M.Jegadeesan | Associate Professor | 9524499063 | m_jegadeesan07@rocketmail.com |
| 9. | Dr.A.S.S.Murugan | Associate Professor | 9344661182 | assm17174@yahoo.co.in |
| 10. | Dr. C.Vimala Rani | Associate Professor | - | jaysanjayvim@gmail.com |
| 11. | Dr.J.Sangeetha | Associate Professor | - | geetha_maniraj@yahoo.com |
| 12. | S.Manoharan | AP(Sr.Gr.) | 9715585524 | sharpmano@yahoo.com |
| 13. | M.Ganesh Kumari | AP(Sr.Gr.) | - | gnshkumari@gmail.com |
| 14. | M.Jeyamurugan | AP(Sr.Gr.) | 9600637578 | jeyam3182@gmail.com |
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| 16. | Dr.M.Maha Lakshmi | Assistant Professor | - | mmahalakshmi36@gmail.com |
| 17. | K.R.Jeyavelumani | Assistant Professor | - | krjeya35@gmail.com |
| 18. | M.Balamurugan | Assistant Professor | 9677564275 | murugan.bala10@gmail.com |
| 19. | T.Gopu | Assistant Professor | 9487059842 | gopu70@gmail.com |
| 20. | R.Jeyapandiprathap | Assistant Professor | 9788671119 | jprathap03@gmail.com |
| 21. | S.Rajalingam | Assistant Professor | 9790248476 | rajalingamrcet@gmail.com |
| 22. | N.Vimal Radha Vignesh | Assistant Professor | 9894965475 | nvimalvignesh@gmail.com |
| 23. | A.Manoj | Assistant Professor | 9487526428 | manojhails@gmail.com |
| 24. | R.Jeyarohini | Assistant Professor | - | rjreee2008@gmail.com |
| 25. | R.C.Hemesh | Assistant Professor | 9443675916 | kirthihemesh@gmail.com |
| 26. | S.P.Rajaram | Assistant Professor | 9786614484 | ramraja798@gmail.com |
| 27. | E.Jeyasri | Assistant Professor | - | jeyasrieswaran@gmail.com |
| 28. | V.Sindhu | Assistant Professor | - | savisindhu@yahoo.co.in |
| 29. | R.Divya | Assistant Professor | - | divyaraajagopal@gmail.com |
| 30. | R.Sridevi | Assistant Professor | - | sridevirs87@gmail.com |
| 31. | M. Bharani lakshmi | Assistant Professor | - | bharanilakshmi.m@gmail.com |

# PLACEMENT ACTIVITY – REMINDER

1. In the month of October every first year students must fill forms online in TATA CONSULTANCY SERVICES (TCS) campus recruitment using **nextsteptcs.com** website and must submit the following documents in the department.
   a. SSLC and HSC mark sheet photo copy at least 5.
   b. Latest passport size Photo at least 5.
   c. Current address proof with parent contact cell numbers.
   d. Create your own two E-mail id using Gmail.
   e. Resume with Scanned copy of passport size Photo.
   f. CT number registered in the TCS website.
2. Every semester end update CGPA in your resume and TCS profile.
3. An Engineering student from Electrical and Electronics Engineering should complete the following courses in order to enhance their software skills. This will be most helpful during their successful completion in Curriculum during 4th Semester and in the software company campus recruitment.
   a. Should complete **C Programming** before joining **2nd Semester**.
   b. Should complete **C++ Programming** before joining **3rd Semester**.
   c. Should complete **JAVA Programming** before joining **4th Semester**. (for the successful completion of object oriented Programming theory paper and laboratory during 4th Semester)
4. An Engineering student from Electrical and Electronics Engineering should complete the **Micro Processor, Micro Controller and Embedded Systems** courses before joining **5th Semester** in order to enhance their Hardware skills. This will be most helpful during their successful completion in Curriculum from 5th to 6th Semester and in the Core company campus recruitment. (for the successful completion of Micro Processor and Micro Controller theory as well as laboratory during 5th Semester and Embedded Systems during 6th Semester)
5. From 6th Semester Summer vacation onwards all should prepare for GATE Examination because all Engineering students from Electrical and Electronics Engineering should appear GATE Examination in order to settle in their life by pursuing higher education in the reputed colleges like IIT, NIT and Anna University or else to join as a Graduate Engineer trainee in a public sector companies like IOC, BHEL, PGCI etc.,
6. Before joining 7th Semester all should get any international certification programme course like OCJP, CCNA, etc., and upload the certification details in TCS campus commune website. This will be most helpful during the TCS campus and other MNC company recruitment.

| Activity | Semester | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| TCS Online form Filling in nextsteptcs.com | In the month of October | | | | | | | |
| Documents to be submitted in the EEE Department/ Placement Coordinator | a. SSLC and HSC mark sheet photo copy at least 5.<br>b. Latest passport size Photo at least 5.<br>c. Current address proof with parent contact cell numbers.<br>d. Create your own two E-mail id using Gmail.<br>e. Resume with Scanned copy of passport size Photo.<br>f. CT number registered in the TCS website. | | | | | | | |
| Updating CGPA in resume and TCS online profile | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| C Programming | ✓ | ✓ | | | | | | |
| C++ Programming | | ✓ | | | | | | |
| JAVA Programming | | | ✓ | | | | | |
| Micro Processor & Micro Controller | | | | ✓ | | | | |
| Embedded Systems | | | | | ✓ | | | |
| GATE / UPSC/ TNPSC Preparation | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| International Certification – OCJP / CCNA | | | | | | ✓ | ✓ | |

**K.L.N. COLLEGE OF ENGINEERING**

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**All India Installed Capacity (in MW) of Power Stations**

This is a **list of states and territories of India by installed capacity of power utilities** with electricity generation mode break-up as on **31 January 2017** with figures in Megawatts.

**INSTALLED CAPACITY (IN MW) OF POWER UTILITIES IN THE STATES/UTS LOCATED IN** SOUTHERN REGION

**INCLUDING ALLOCATED SHARES IN JOINT & CENTRAL SECTOR UTILITIES**

**(As on 31.01.2017)**

| State | Ownership / Sector | Modewise breakup | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Thermal | | | | Nuclear | Hydro (Renewable) | RES (MNRE) | |
| | | Coal | Gas | Diesel | Total | | | | |
| **Andhra Pradesh** | State | 3085.91 | 235.40 | 0.00 | 3321.31 | 0.00 | 1808.87 | 89.50 | 5219.68 |
| | Private | 3650.00 | 3074.11 | 16.97 | 6741.08 | 0.00 | 0.00 | 3660.99 | 10402.07 |
| | Central | 1540.30 | 0.00 | 0.00 | 1540.30 | 127.16 | 0.00 | 0.00 | 1667.46 |
| | **Sub-Total** | **8276.21** | **3309.51** | **16.97** | **11602.69** | **127.16** | **1808.87** | **3750.49** | **17289.22** |
| **Telangana** | State | 5406.59 | 0.00 | 0.00 | 5406.59 | 0.00 | 2245.66 | 0.00 | 7652.25 |
| | Private | 270.00 | 1570.89 | 19.83 | 1860.72 | 0.00 | 0.00 | 1230.21 | 3090.93 |
| | Central | 1799.88 | 0.00 | 0.00 | 1799.88 | 148.62 | 0.00 | 0.00 | 1948.50 |
| | **Sub-Total** | **7476.47** | **1570.89** | **19.83** | **9067.19** | **148.62** | **2245.66** | **1230.21** | **12691.68** |
| **Karnataka** | State | 4220.00 | 0.00 | 127.92 | 4347.92 | 0.00 | 3599.80 | 155.33 | 8103.05 |
| | Private | 2060.00 | 0.00 | 25.20 | 2085.20 | 0.00 | 0.00 | 5949.21 | 8034.41 |
| | Central | 2028.46 | 0.00 | 0.00 | 2028.46 | 475.86 | 0.00 | 0.00 | 2504.32 |
| | **Sub-Total** | **8308.46** | **0.00** | **153.12** | **8461.58** | **475.86** | **3599.80** | **6104.54** | **18641.78** |
| **Kerala** | State | 0.00 | 0.00 | 159.96 | 159.96 | 0.00 | 1881.50 | 145.02 | 2186.48 |
| | Private | 0.00 | 174.00 | 0.00 | 174.00 | 0.00 | 0.00 | 119.36 | 293.36 |
| | Central | 1073.69 | 359.58 | 0.00 | 1433.27 | 228.60 | 0.00 | 0.00 | 1661.87 |
| | **Sub-Total** | **1073.69** | **533.58** | **159.96** | **1767.23** | **228.60** | **1881.50** | **264.38** | **4141.71** |
| **Tamil Nadu** | State | 4660.00 | 524.08 | 0.00 | 5184.08 | 0.00 | 2203.20 | 122.70 | 7509.98 |
| | Private | 2950.00 | 503.10 | 411.70 | 3864.80 | 0.00 | 0.00 | 10249.07 | 14113.87 |
| | Central | 4255.10 | 0.00 | 0.00 | 4255.10 | 986.50 | 0.00 | 0.00 | 5241.60 |
| | **Sub-Total** | **11865.10** | **1027.18** | **411.70** | **13303.98** | **986.50** | **2203.20** | **10371.77** | **26865.45** |
| **NLC** | State | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Private | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Central | 100.17 | 0.00 | 0.00 | 100.17 | 0.00 | 0.00 | 0.00 | 100.17 |
| | **Sub-Total** | **100.17** | **0.00** | **0.00** | **100.17** | **0.00** | **0.00** | **0.00** | **100.17** |
| **Puducherry** | State | 0.00 | 32.50 | 0.00 | 32.50 | 0.00 | 0.00 | 0.00 | 32.50 |
| | Private | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 |
| | Central | 249.32 | 0.00 | 0.00 | 249.32 | 52.78 | 0.00 | 0.00 | 302.10 |
| | **Sub-Total** | **249.32** | **32.50** | **0.00** | **281.82** | **52.78** | **0.00** | **0.03** | **334.63** |
| **Central - Unallocated** | | 1643.08 | 0.00 | 0.00 | 1643.08 | 300.48 | 0.00 | 0.00 | 1943.56 |
| **Total (Southern Region)** | State | 17372.50 | 791.98 | 287.88 | 18452.36 | 0.00 | 11739.03 | 512.55 | 30703.94 |
| | Private | 8930.00 | 5322.10 | 473.70 | 14725.80 | 0.00 | 0.00 | 21208.87 | 35934.67 |
| | Central | 12690.00 | 359.58 | 0.00 | 13049.58 | 2320.00 | 0.00 | 0.00 | 15369.58 |
| | **Grand Total** | **38992.50** | **6473.66** | **761.58** | **46227.74** | **2320.00** | **11739.03** | **21721.42** | **82008.19** |

'*'Renewable Energy Sources (RES) includes small hydro projects, wind, solar, tidal, biomass and urban & industrial waste power.

**GOVERNMENT OF INDIA**

MINISTRY OF SKILL DEVELOPMENT AND ENTERPRENEURSHIP

DIRECTORATE GENERAL OF TRAINING

## ADVANCED TRAINING INSTITUTE

( AN ISO 29990 : CERTIFIED)

Guindy, CHENNAI, Tamilnadu

Phone : 044-22501211/0252 Fax : 044-22501460, Email : atichn@vsnl.com, atichn@yahoo.com, Url : www.atichennai.org.in

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**ATI Chennai : Regular Course Training Schedule**

**Advanced Vocational Training Scheme (AVTS) - Short Term Programme**

**Annual Training calendar 2017 – 2018**

**(Short Term Skill Training Programme)**

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| | Course Code | Course Title | Duration (Week) | Date | |
|---|---|---|---|---|---|
| | | | | From | To |
| GROUP:1 | **ELECTRICAL CONTROL MAINTENANCE** | | | | |
| | 01.01 | Protective Relays , Circuit Breakers, & Switch Gear Protection | 01 | 03-04-2017 | 07-04-2017 |
| | | | | 15-05-2017 | 19-05-2017 |
| | | | | 05-06-2017 | 09-06-2017 |
| | | | | 10-07-2017 | 14-07-2017 |
| | | | | 21-08-2017 | 25-08-2017 |
| | | | | 09-10-2017 | 13-10-2017 |
| | | | | 13-11-2017 | 17-11-2017 |
| | | | | 18-12-2017 | 22-12-2017 |
| | | | | 29-01-2018 | 02-02-2018 |
| | | | | 19-02-2017 | 23-02-2017 |
| | 01.02 | Operation and Maint. Of Power Transformers | 01 | 17-04-2017 | 21-04-2017 |
| | | | | 12-06-2017 | 16-06-2017 |
| | | | | 17-07-2017 | 21-07-2017 |
| | | | | 04-09-2017 | 08-09-2017 |
| | | | | 23-10-2017 | 27-10-2017 |
| | | | | 20-11-2017 | 24-11-2017 |
| | | | | 01-01-2018 | 05-01-2018 |
| | | | | 05-02-2018 | 09-02-2018 |
| | | | | 26-02-2017 | 02-03-2017 |
| | | | | 19-03-2017 | 23-03-2017 |
| | 01.03 | Operation & Control of Industrial AC / DC Motors | 01 | 24-04-2017 | 28-04-2017 |
| | | | | 22-05-2017 | 26-05-2017 |
| | | | | 19-06-2017 | 23-06-2017 |
| | | | | 24-07-2017 | 28-07-2017 |
| | | | | 28-08-2017 | 01-09-2017 |
| | | | | 18-09-2017 | 22-09-2017 |
| | | | | 31-10-2017 | 03-11-2017 |
| | | | | 04-12-2017 | 08-12-2017 |
| | | | | 08-01-2018 | 12-01-2018 |
| | | | | 05-03-2018 | 09-03-2018 |
| | 01.04 | Electrical Safety at Work Place and First Aid | 01 | 01-05-2017 | 05-05-2017 |
| | | | | 29-05-2017 | 02-06-2017 |
| | | | | 03-07-2017 | 07-07-2017 |
| | | | | 07-08-2017 | 11-08-2017 |
| | | | | 11-09-2017 | 15-09-2017 |
| | | | | 06-11-2017 | 10-11-2017 |
| | | | | 04-12-2017 | 08-12-2017 |
| | | | | 15-01-2018 | 19-01-2018 |
| | | | | 12-02-2018 | 16-02-2018 |
| | | | | 12-03-2018 | 16-03-2018 |

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**GOVERNMENT OF INDIA**

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DIRECTORATE GENERAL OF TRAINING

**ADVANCED TRAINING INSTITUTE**

( AN ISO 29990 : CERTIFIED)

Guindy, CHENNAI, Tamilnadu

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**ATI Chennai : Regular Course Training Schedule**

**Advanced Vocational Training Scheme (AVTS) - Short Term Programme**

**Annual Training calendar 2017 – 2018**

**(Short Term Skill Training Programme)**

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| GROUP:1 | **ELECTRONIC CONTROL MAINTENANCE** | | | |
|---|---|---|---|---|
| Course Code | Course Title | Duration (Week) | **Date** | |
| | | | From | To |
| 02.01 | Power Electronics and its Industrial Applications | 01 | 03-04-2017 | 07-04-2017 |
| | | | 05-06-2017 | 09-06-2017 |
| | | | 02-10-2017 | 06-10-2017 |
| | | | 04-12-2017 | 08-12-2017 |
| | | | 19-02-2018 | 23-02-2018 |
| 02.02 | 8051 Programming & Applications | 01 | 10-04-2017 | 14-04-2017 |
| | | | 12-06-2017 | 16-06-2017 |
| | | | 31-07-2017 | 04-08-2017 |
| | | | 21-08-2017 | 25-08-2017 |
| | | | 09-10-2017 | 13-10-2017 |
| | | | 11-12-2017 | 15-12-2017 |
| | | | 26-02-2018 | 02-03-2018 |
| 02.03 | PIC Micro Controller Programming & Applications | 01 | 24-07-2017 | 28-07-2017 |
| | | | 25-09-2017 | 29-09-2017 |
| 02.04 | Siemens S7-400 PLC Step-7 (Level-1) | 01 | 17-04-2017 | 21-04-2017 |
| | | | 19-06-2017 | 23-06-2017 |
| | | | 07-08-2017 | 11-08-2017 |
| | | | 16-10-2017 | 20-10-2017 |
| | | | 18-12-2017 | 22-12-2017 |
| | | | 04-09-2017 | 08-09-2017 |
| | | | 05-03-2018 | 09-03-2018 |
| 02.05 | Computer Hardware maintenance & Net Working | 01 | 24-04-2017 | 28-04-2017 |
| | | | 26-06-2017 | 30-06-2017 |
| | | | 11-09-2017 | 15-09-2017 |
| | | | 23-10-2017 | 27-10-2017 |
| | | | 25-12-2017 | 29-12-2017 |
| | | | 05-02-2018 | 09-02-2018 |
| | | | 12-03-2018 | 16-03-2018 |
| 02.06 | Siemens S7-400 PLC Programming (TIA PORTAL) (Level-1) | 01 | 01-05-2017 | 05-05-2017 |
| | | | 29-05-2017 | 02-06-2017 |
| | | | 03-07-2017 | 07-07-2017 |
| | | | 18-09-2017 | 22-09-2017 |
| | | | 30-10-2017 | 03-11-2017 |
| | | | 01-01-2018 | 05-01-2018 |
| | | | 19-03-2018 | 23-03-2018 |
| 02.07 | Siemens PLC-S7-1200 & Drive for Position Control Applications | 01 | 08-05-2017 | 12-05-2017 |
| | | | 10-07-2017 | 14-07-2017 |
| | | | 06-11-2017 | 10-11-2017 |
| | | | 08-01-2018 | 12-01-2018 |

## List of PSUs through GATE Exam

| Name of PSU | Eligible Branches | Name of PSU | Eligible Branches | Name of PSU | Eligible Branches |
|---|---|---|---|---|---|
| ONGC Ltd. | XE, GG | MDL | ME, EE | NLC | ME, EE, EC, IN, MN, CE |
| NHPC Limited | EE | PSPCL Ltd | ME, EE, EC, IN, CE, CS | NALCO | ME, EE, EC, IN, MT, CE, MN, CS, CH |
| BPCL Limited | ME, EE, CH, IN, CE | OPGC Ltd | ME, EE, CE, C & I | RITES | CE, ME |
| CEL | EC, ME, EE, XE | IRCON International Ltd | EC, EE, IN | NPCCL | CE |
| Coal India Ltd. | ME, EE, MN, GG | BNPM | ME, EE, EC, CH | MECL | ME, CY, GG |
| POWERGRID | EE, CE, CS | AAI | EC, EE | NBCC Ltd. | CE |
| Indian Oil | CH, CE, CS, EE, EC, GG, IN, ME, MT, MN | BBNL | EC, EE, CS | PAPCL | EE, EC, ME, IN, CS |
| THDC India Ltd | ME, EE, CE | NFL | EE, CS, CH, IN, XE | | |
| HPCL | ME, EE, CE, IN, CH, EC | GSECL | EE, ME, MT, C & I | | |
| NTPC Limited | ME, EC, EE, IN | GAIL | ME, EE, IN, CH | | |

**Lists of TOP 10 software companies to offer jobs in India**

| S. No. | Name of the Company | About the company | Head quarters | Revenue | No. of Employees | Website |
|---|---|---|---|---|---|---|
| 1. | **Tata Consultancy Services** | TCS was established in 1968 and is spread across 47 countries. | Mumbai, India | US$ 13.44 billion | 300,464 | www.tcs.com |
| 2. | **Cognizant Technology Solutions** | CTS was founded in year 1994 by Srilankan American Kumar Mahadeva. | Teaneck, New Jersey, United States | US$ 8.84 billion | 178,000 | www.cognizant.com |
| 3. | **Infosys** | Infosys was founded in year 1981. | Bangalore, Karnataka | US$ 8.4 billion | 160,405 | www.infosys.com |
| 4. | **Wipro** | Azim Premji is the Chairman & TK Kurien is the CEO of Wipro. | Mumbai, India | US$7.3 billion | 146,053 | www.wipro.com |
| 5. | **Tech Mahindra** | Tech Mahindra was founded in year 1986 | Mumbai | $4.09 billion | 89,500 | www.techmahindra.com |
| 6. | **HCL Technologies** | HCL was founded by Shiv Nadar in year 1991. | Noida, Uttar Pradesh | US$335 million | 90,190 | www.hcltech.com |
| 7. | **iGate** | iGate was earlier known as Patni Computer Systems and was founded by Narendra Patni and his wife. | Bridgewater, New Jersey, U.S | US$ 1.15 billion | 31,000 + | www.igate.com |
| 8. | **Mphasis** | MPhasis was founded by Jaithirth Rao in year 2000 | Bangalore, India | US$1.0 billion | 45,426 + | www.MphasiS.com |
| 9. | **Larsen &Toubro Infotech** | L & T Infotech was founded in year 1997 | Mumbai | US$ 650 million | 16,000+ | www.lntinfotech.com |
| 10. | **Oracle Financial Services Software Limited** | Oracle Financial Services Software Limited was earlier know as i-Flex Solutions Limited. It is spread across 130 countries around the globe and provides the IT solutions to the financial companies. | Mumbai, India | US$610 million | 9,682 | www.oracle.com |

**Lists of TOP 10 core companies to offer Electrical jobs**

**1 | Bharat Heavy Electricals Ltd.**
**Corporate office** – New Delhi, India | **Establishment** – 1964 |
**Business** – Electrical equipments | **Website** – *www.bhel.com* |

Bharat Heavy Electricals Ltd established in the year 1964 is a leading power plant equipment manufacturer and has expertise in engineering, manufacture, construction, testing, designing and servicing of various products of the core sectors such as defense, power, industries etc. BHEL is among the top electrical companies in India and which has total 16 manufacturing divisions and four regional offices. It is currently operating more than 150 project sites across India and abroad.

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**2 | Alstom**
**Corporate office** – Levallois-Perret, France | **Establishment** – 1928 |
**Business** – Power generation and transmission | **Website** – *www.alstom.com* |

Alstom a multinational corporation is one of the best electrical companies in India and world, operating in hydroelectric power transportation and generation and it is active in many core industry sector. Company has a workforce of 9000+ employees in India and over 85000+ worldwide.

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**3 | ABB**
**Corporate office** – Zürich, Switzerland | **Establishment** – 1988 |
**Business** – Electrical equipments | **Website** – *www.abb.com* |

ABB holds interests in robotics and mainly in the automation and power areas. ABB is active in the field of electricity grids manufacturing and other technologies in the field of automation and power. ABB is one of the few giant electrical player at global level and among the largest engineering company in the world.

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**4| Siemens**
**Corporate office** – Erlangen, Germany | **Establishment** – 1847 |
**Business** – Renewable energy, Power generation & transmission| **Website** – *www.energy.siemens.com* |

Siemens a German conglomerate is rated one the finest electrical company in India. Company's product line includes generators, steam turbines, compressors, high-voltage switching products and many more. Siemens employees more than 86000 people worldwide and it is a leading supplier of energy related products worldwide.

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**5 | Crompton Greaves**
**Corporate office** – Mumbai, Maharashtra | **Establishment** – 1878 |
**Business** – Electrical | **Website** – *www.cgglobal.com* |

Crompton Greaves is a part of Avantha Group which is headquartered in Mumbai. CGL deals in manufacturing, marketing and designing of power transmission and generation related products. CGL has manufacturing units in Canada, France, Hungary, UK, US, Indonesia, Ireland, India and Belgium.

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**6 |Bajaj Electricals Ltd.**
**Corporate office** – Mumbai, Mharashtra | **Establishment** – 1938 |
**Business** – Electrical Appliances | **Website** – *www.bajajelectricals.com* |

Bajaj Electricals is a leader in the field of electrical equipment and headquartered in Mumbai. It is one of the top 5 electrical companies in India having 19 branch offices across India. Bajaj Electricals provides complete range of consumer durable such as fan, electrical appliances, lighting which includes tubes, lamps etc.

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**7 | Eason Reyrolle**
**Corporate office** – Bangalore, Karnataka | **Establishment** – 1986 |
**Business** – Electric Equipments & Industrial Consumables | **Website** – *www.easunreyrolle.com* |

Established in 1980 Easun Reyrolle is a Power Management Products, Transmission, Distribution & Industrial Application, Systems, Solutions and Services provider having significant presence in global market as reputed electrical products manufacturer.

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**8 | Schneider Electrical**
**Corporate office** – Rueil Malmaison, France | **Establishment** – 1981 |
**Business** – Electric Equipment | **Website** – *www.schneider-electric.co.in* |

Schneider Electric a French company established in the year 2000 is among the top electrical companies in India which is involved in energy management. Company has a workforce of more than 17000 employees and has 31 global manufacturing Plants.

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**9| Wipro Lighting**
**Corporate office** – Pune, Maharashtra | **Establishment** – |
**Business** – Lamps, Luminaires and Accessories | **Website** – *www.wiprolighting.com* |

Wipro lightings a part of Wipro group and a leading electrical company in India producing Lamps, luminaries and accessories. Company's product portfolio comprises of high end lighting control and architectural dimming system, high intensity discharge lamp Luminaries, brightness management lighting products etc.

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**10| Kelvin Electrical**
**Corporate office** – Al-Ain, U.A.E | **Establishment** – 2005 |
**Business** – | **Website** – *www.kelvin-electrical.com* |

Kelvin Electrical LLC founded in 2005 is based in United Arab Emirates (UAE). Kelvin Electrical deals in Cable Management Systems, Interior, Architectural, Exterior and Special lighting, Cable Support Systems, Raised Floor, Wiring Accessories etc.

**K.L.N. COLLEGE OF ENGINEERING**

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**Lists of core companies to offer Electrical jobs in India**

**Types of Electrical Core Companies**

1. **Electrical motors and Generators**
2. **Consultancy (Electrical Engineering)**
3. **Electrical appliances**
4. **Electrical components companies**
5. **Lighting & luminaries**
6. **Power Generation**
7. **Electric wires & Cables**
8. **Electrical exporters**
9. **Measurements & Instrumentation**
10. **Power Distribution**
11. **Transformers**
12. **Green Energy Companies in India**
13. **Internationally renowned MNC'S**
14. **Top 20 core companies in India to offer electrical jobs**
15. **Exclusive Government jobs for Electrical Engineers**

**Electrical motors and Generators**

1. Ajay Engineers http://www.ajayengineers.com
2. All India Electric Motor Manufacturers' Association http://www.aiemma.com/
3. Aqua Brand Submersible Sewage Pump http://www.aquapumps.com
4. Compact http://www.compactlighting.net
5. Crown Electric Company http://www.crown-gear.com
6. Lawkim http://lawkimindia.com/
7. MMC Electric Company http://www.dynafluxindia.com
8. MS Enterprises and Trimega Power Corporation http://www.msein.com
9. National Electrical Industries - Ahmedabad. http://www.elmomachines.com/
10. Numeric Power Systems http://www.numericups.com
11. Pranshu Electricals http://www.pranshuelec.com/
12. Reva Industries http://www.reva.com/
13. Rotomag Motors & Controls Pvt. Ltd. http://www.rotomag.com
14. Rudrashakti Electronics http://www.rudrashakti.com
15. Sanjay Diesels - Diesel Generating Sets. http://www.dgsets.com/
16. Venus Industrial Corporation http://www.venusind.com/
17. A-One Industries. http://www.aoneindustries.com/contactus.html

**Consultancy (Electrical Engineering)**

1. APJ Projects http://www.apjprojects.com
2. Consolidated Consultants and Engineers Pvt. Ltd http://www.consolidatedconsultants.com
3. DSON Enterprises http://www.dsonenterprises.com
4. Eltech Engineers http://www.eltechindia.com/
5. John Mech-El Technologies (P) Ltd http://www.johnmech-el.com/
6. Mandvi Electric Works http://www.bicserve.com/
7. Miraj Instrumentation Services http://www.mirajinstrumentation.com
8. PG Associates http://www.engineeringconsultant.in
9. Power Gem Engineers - Consultants in Power Generation. http://www.powergem.com/
10. Secon Engineers http://www.seconindia.com
11. Shanti Enterprises Electricals Limited http://www.shantielectricals.com
12. Shashi Electricals http://www.shashielectricals.com
13. SK Systems http://www.sksystem.com
14. Tata Consulting Engineers http://www.tce.co.in
15. Nutronics India http://www.nutronicsindia.com/

## Electrical appliances

1. Ajay Industrial Corporation http://www.ajayindustrial.com/
2. Ankit Electricals http://www.ankitelectricals.com
3. A.P.C. System & Products Pvt. Ltd http://www.apcsp.com
4. Arka Trading & Services http://www.mfdplaza.in
5. Bajaj Electricals Ltd - Part of Bajaj Group. http://www.bajajelectricals.com/
6. Electroil http://www.electroil.com/
7. Eveready Industries India Ltd http://www.evereadyindustries.com/
8. Graftec india http://graftec.trade-india.com
9. Indexelectronics http://www.indexelectronics.com
10. Khaitan Group http://www.khaitan.com/
11. Lloyd Electric & Engineering Limited http://www.lloydengg.com/
12. Modern Electrical Stores http://www.modernelectricalsindia.com/
13. Needo electronics and electricals pvt. Ltd. http://www.needoindia.com
14. Picasso home products http://www.picassoappliances.com/
15. Polor Industries Ltd http://www.polarinc.com/
16. Rajshree India Ltd. http://www.rajshreefans.com
17. Shilpa Electricals http://www.shilpaelectricals.com/
18. Super Impex http://www.superimpex.com
19. Tri Star Engineering Industries http://www.tristarengg.com
20. Vijay Electricals http://www.vijayelectricalspune.com/
21. Vxl Technologies Ltd. http://www.vxldesign.com
22. XtremeWorx http://www.xtremeworx.net

## Electrical components companies

1. Ace Bimetalliks India Pvt. Ltd. http:// www.aceelectricals.com
2. Aditron India Pvt. Ltd. (Engineering Division) http://www.aiplen.com
3. Admir Ovens http://www.admir.com
4. Arvind Anticor Ltd http://www.picklingplant.com
5. Asiatic Electronic Industries. http://www.asiatic-india.com/
6. Axis Electrical Components India Pvt. Ltd. http://www.axis-india.com
7. Balar Marketing Pvt. Ltd http://www.allelectricalproducts.com/
8. Bhartia Industries Limited http://www.bchindia.com
9. Brass Copper & Alloy (I) Ltd. http://www.hexworldwide.com
10. Brightech Valves and Controls Pvt. Ltd. http://www.brightechvalves.com
11. Caltech Engineering Services http://www.caltechindia.com
12. Color Design India http://www.colordesigntech.com/
13. Consult Techniques (I) Pvt. Ltd http://www.consulttechnique.com/
14. Deki Electronics Ltd. http://www.dekielectronics.com
15. Elpro International Limited http://www.elproindia.com/
16. Elymer http://www.elymer.com
17. E S Electronics (India) Pvt. Ltd http://www.energysaversindia.com/
18. Finetech Engineering Corporation http://www.finetechindia.com
19. Gayatri Control, Ahmedabad http://www.gayatricontrol.com/
20. Gemscab Industries Ltd http://www.gemscab.com/
21. Hallmark Electronics http://www.hallmarkelect.com/
22. India International House Ltd http://www.builderhardware.com/
23. Jaykrishna magnetics pvt.ltd http://www.jkmagnetics.com
24. Leotech Group http://www.leotechindia.com/
25. Maxx Mobile Phone Accessories Pvt. Ltd http://www.maxmobile.co.in
26. Mehta Engineering Enterprise http://www.mehtaswitch.com

27. Mehta Tubes Ltd http://www.mehta-group.com/
28. Mellcon Engineers http://www.mellcon.com
29. Micromot Controls http://www.micromotcontrols.com
30. Muskaan Engineers http://www.electricitysaver.com/
31. Neelam Import Pvt. Ltd. http://www.cellking.org
32. Onload Gears http://www.onloadgears.com/
33. Orton Engineering Pvt. Ltd, Thane http://www.ortonengineering.com/
34. Persang Alloy Industries http://www.webmasterindia.com/persangalloy
35. PMT Engineers http://www.pmtengineers.com
36. Powercap Systems (Madras) Pvt. Ltd http://www.transformersindia.com/
37. Powertek Equipment Company http://www.powertekindia.com/
38. Pragati Electrocom Pvt. Ltd http://www.pragatielectrocom.com/
39. Pran Electronics Pvt. Ltd. http://www.pranelectronics.com
40. Precicraft Components India Pvt. Ltd http://www.precicraft.com/
41. Prima Automation India Pvt. Ltd http://www.prima-automation.com/
42. Rittal India Pvt Ltd http://www.rittal-india.com
43. Sanghi Yantra Udyog http://www.skyuindia.com/
44. SKN - Bentex Group of Companies. http://www.sknbentex.com/
45. South India Industrial Suppliers http://siis-india.com/bus_bar_support.html
46. Square Automation Pvt. Ltd http://www.squareautomation.com/
47. Sudhir Switchgears http://www.sudhirswitchgears.com
48. Syntron Controls http://www.syntron-controls.com
49. Torque Master Tools Pvt. Ltd http://www.torquemasterindia.com/
50. United Core http://www.unitedcores.com/
51. Utiliti Controls http://www.utiliticontrols.com/
52. valrack modular systems pvt.ltd http://www.valrack.com
53. Wavetronics http://www.wavetronicsindia.com
54. Rane Holdings Limited http://www.rane.co.in

**Lighting & luminaries**

1. A.K. Electricals http://www.akelectricals.com/
2. APCO India http://www.indiabizclub.net/Electrical/APCO_INDIA.html
3. Aquascape engineers http://www.fountainsnozzles.com
4. Arihant Enterprises : http://www.arihantsecurityindia.com/
5. Atlas Electricals www.indiabizclub.net/Electrical/ATLAS_ELECTRICALS.html
6. Baliga Lighting http://www.baliga.com/
7. Crompton Greaves Limited. http://www.cglonline.com/
8. Decon Lighting http://deconlighting.com
9. GE Lighting India http://www.gelighting.com/india/index.html
10. Jain Industrial Lighting Corporation http://www.indiamart.com/jilco/
11. Jayanta Lamp Industries Pvt.Ltd : http://www.jayantagroup.com
12. Kuber Lighting Pvt Ltd http://www.kuber.biz
13. Litray Lighting : http://www.litraylighting.com/
14. Mindscreen Pvt. Ltd. http://www.mindscreenfilms.com/
15. Peralites http://www.indiabizclub.net/Electrical/PEARLITES.html
16. Sam International http://www.indiamart.com/
17. Shyam Electricals - http://www.shyamelectricals.com/
18. Hpl Electric & Power Pvt.Ltd http://www.hplindia.com

**Power Generation**

1. Advance Engineering Company - http://www.advanceengineering.com/
2. APGENCO http://www.apgenco.com/

3. Birla Power Solutions Limited http://www.birlapower.com
4. Dyna Hitech Power Systems Ltd http://www.dynahitech.com
5. Essar Group http://www.essar.com/Group/group.asp
6. Essar Power Ltd. http://www.essar.com/
7. Jindal Steel & Power Ltd. http://www.jindalsteelpower.com
8. Kaiga Atomic Power Station http://www.npcil.org/docs/kaigaps.htm
9. Kakrapar Atomic Power Station http://www.npcil.org/docs/kaps.htm
10. Kirloskar Electric Co http://www.kirloskar-electric.com/
11. Lanco Industries http://www.lancogroup.com/groups/kpower/kpower.html
12. Madras Atomic Power Station (MAPS) http://www.npcil.org/
13. Magnum Power Generation Ltd http://www.magnumgrouponline.com/power/
14. Narora Atomic Power Station http://www.npcil.org/docs/naps.htm
15. National Thermal Power Corporation (NTPC) http://www.ntpc.co.in
16. NEPC India Ltd http://www.nepcindia.com
17. PTC India http://www.ptcindia.com
18. Rajasthan Atomic Power Station (RAPS) http://www.npcilraps.com/
19. Rajasthan Renewable Energy Corporation Limited (RRECL) http://www.rrecl.com/
20. Reliance Energy http://www.rel.co.in
21. Tarapur Atomic Power Station http://www.npcil.org/docs/taps.htm
22. Tata Electric Companies http://www.tata.com
23. Tata Power http://www.tatapower.com/
24. Techno Instrument India Pvt.Ltd web site url: http://www.tiiindia.com/
25. Torrent Power web site url: http://www.torrentpower.com/
26. Uttar Pradesh Power Corporation Ltd http://www.uppcl.org/
27. ABB Ltd www.abb.co.in/
28. Adani Power Ltd www.adanipower.com/
29. Aplab Ltd www.aplab.com/
30. BF Utilities Ltd www.bfutilities.com/
31. CESC Ltd. www.cescltd.com/
32. CMI Ltd. www.cmilimited.com.au/
33. DLF Power Limited www.eipowertech.com/dlf_power_limited.htm
34. DPSC Ltd www.dpscl.com/
35. Energy Development Company Ltd www.energy.com.ph/
36. Entegra Ltd www.entegra.co.in/
37. GMR Infrastructure Ltd www.gmrgroup.in/
38. Gujarat Industries Power Company Ltd www.gipcl.com/
39. GVK Power & Infrastructure Ltd www.gvk.com/
40. HBL Power Systems Ltd www.hbl.in/
41. Indowind Energy Ltd www.indowind.com/
42. Indo power projects Ltd www.indopowerprojects.in/
43. Jaiprakash Power Ventures Ltd www.jppowerventures.com/
44. Kalpataru Power Transmission Ltd www.kalpatarupower.com/
45. KSK Energy Ventures Ltd www.ksk.co.in/
46. National Wind & Power Corpn. Ltd www.nationalwind.com/
47. Neyveli Lignite Corpn. Ltd www.nlcindia.com/
48. NHPC Ltd. www.nhpcindia.com/
49. NTPC Limited www.ntpc.co.in/
50. Power Grid Corpn. Of India Ltd www.powergridindia.com/
51. PTC India Ltd www.ptcindia.com/
52. Reliance Power Ltd www.reliancepower.co.in/

53. Savant Infocomm Ltd www.savant-infocomm.com/
54. Sun Source (India) Ltd www.sunsource.in/about_us.htm
55. Suryachakra Power Corpn. Ltd www.suryachakra.in/
56. Suzlon Energy Limited www.suzlon.com/

**Electric wires & Cables**

1. Aksh Optifibre Limited http://www.akshoptifibre.com/
2. Anant Distributors Private Ltd. http://www.proflexcable.com/
3. Brimson Cables Private Ltd http://www.brimsoncable.com/
4. Capital Cables India Limited - http://www.indiantrade.com/cci/
5. Colt Cables Private Limited http://www.coltcables.com/
6. Cords Cable Industries Ltd http://www.cordscable.com/
7. Delton Cables Limited - http://www.deltoncables.com/
8. Fort Gloster Industries Limited http://www.glostercables.com/
9. Kaydour Cables India http://www.kaydourcables.com
10. KEI Industries Limited http://www.kei-ind.com/
11. Lapp India http://www.lappindia.com/
12. National Cable Industries http://www.nationalcables.com/
13. Navinbhai Cables Private Ltd http://www.ncplindia.com/
14. Neolex Cables http://www.neolexcable.com/
15. North Eastern Cables Private Ltd //www.khetangroup.com/
16. Novoflex Marketing Private Limited. http://www.novoflexgroup.com/
17. Polycab Wires Private Limited http://www.polycab.com/
18. Q-Flex Cables Limited http://www.qflexcable.com/
19. Ravin Cables limited - Primecab brand of cables. http://www.primecab.com/
20. Relemac India http://www.relemacindia.com
21. RollRing Industries - Calicut, Kerala. http://www.rollring.com/
22. Samdaria Electricals http://www.samdariaelectricals.co.in/
23. Satish Enterprises http://www.satishenterprise.com/
24. Shree Nakoda Cables Private Limited. http://www.nakodacables.com/
25. Skytone Electricals (India) http://www.skytonecables.com/
26. Surbhi Cables Industries Private Limited. http://www.indiamart.com/surbhi/
27. Surbhi Telelink Pvt. Ltd http://www.surbhiindia.com/
28. Torrent Cables Ltd http://www.torrentcables.com/
29. Universal Cables http://www.universalcablesltd.com
30. Usha Martin http://www.ushamartin.com
31. Weather Crafts Ltd http://www.weathercraft.com/
32. Finolex Cables Limited http://www.finolex.com

**Electrical exporters**

1. Arbariya steels http://www.arbariya.com/
2. Bajaj International Pvt. Ltd. http://www.bajajinternational.com/
3. Biax http://www.biaxmetals.com/
4. Brightech Valves and Controls Pvt Ltd http://www.brightechvalves.com
5. Dynamic Scaffolding & Equipment Co http://www.dynamicscaffolding.com/
6. Excel Metal And Engg. Industries http://www.excelmetal.net
7. Impex Trading Company http://www.impextradingco.com
8. Miltop Trading Company http://www.miltop.com/
9. Om(India)Exports http://omindiaexpo.com
10. Oriental Export Corporation http://www.indialinks.com/oriental/
11. Sevana Electrical Group http://www.sevana.com/
12. Veejay Lakshmi Engineering Works Limited http://www.veejaylakshmi.com

13. Vishal Electromag Industries http://www.vishalmotor.com
14. Vaibhav Electricals http://www.vaibhavelectricals.com
15. Industrial Forging Industries http://www.ifi-india.net/
16. Imperial Brass Component http://electronics-electrical.exportersindia.com
17. M/s Horizon Exports http://www.horizonexport.net
18. Golden Crest Marketing Network Pvt. Ltd. http://www.aceenergy.co.in/
19. Shree Krishna Enterprises http://www.shreekrishnaenterprises.co.in/
20. Sahiba International Trading Company http://www.sahibainternational.com
21. Pushpak Metals web site url: http://www.pushpakmetals.com/
22. IEEMA http://www.ieema.org
23. ELSTER METERING (P) LTD http://www.elstermetering.com/
24. Shivam Electronics http://www.shivamelectronics.com
25. SUBRTO http://www.subrtoburnishing.com/
26. Unitek Engineers http://www.unitekengineers.com
27. Euro Technologies http://www.eurotapes.in/

**Measurements & Instrumentation**

1. Active Control Pvt Ltd http://www.indiamart.com/activecontrols/
2. Autometers Alliance Limited. http://www.autometers.com/
3. EIP Bulk Control Pvt Ltd http://www.eipbulkcontrols.com/
4. IMP Power Limited http://www.imp-power.com/
5. Instruments International http://www.indorecity.com/ii/index.html
6. Kanji Precision Works http://www.kanjimeters.com
7. Mittal Enterprises http://www.indiamart.com/mittalenterprises/
8. Modsonic http://www.modsonic.com/
9. Nippon Instruments http://www.nipponinstruments.com/
10. Poonawala Electro Weigh http://www.peweigh.com
11. Prok Devices http://www.prokdvs.com
12. Shanti Instruments http://www.shanti-instruments.com
13. Texlab Industries http://www.texlabindia.com
14. Vasavi Electronics http://www.vasavi.com
15. VPL Infotech http://vplinf.com

**Power Distribution**

1. Areva T&D India http://www.areva-td.co.in/
2. BSES Yamuna Power Ltd and BSES Rajdhani Power Ltd. http://www.bsesdelhi.com/
3. Central Power Distribution Company of Andhra Pradesh Limited http://www.apcentralpower.com/
4. CESC Limited http://www.cescltd.com
5. Eastern Power Distribution Company of Andhra Pradesh Limited http://www.apeasternpower.com/
6. Elpro International Limited http://www.elproindia.com/
7. Gujarat Electricity Board http://www.gseb.com
8. Haryana Power Utilities http://www.haryanaelectricity.com/
9. Hubli Electricity Supply Company Limited (HESCOM) http://www.hescom.org/
10. Maharashtra State Electricity Distribution Company Limited http://www.mahadiscom.in
11. Natinal Hydroelectric Power Corporation of India http://www.nhpcindia.com
12. Noida Power Company Ltd http://www.noidapower.com
13. North Delhi Power Limited http://www.ndplonline.com/
14. Power Grid Corporation Of India http://www.powergridindia.com
15. Southern Power Distribution of Andhra Pradesh http://www.apspdcl.in
16. Transmission Corporation of Andhra Pradesh (AP TRANSO) http://www.aptranscorp.com/

## Transformers

1. Emco Limited http://www.emcoindia.com
2. Golecha Electro Stampings. http://www.golecha.com/
3. Intaf India http://www.intafindia.com/
4. Kappa Electricals Private Ltd http://www.kappaelectricals.com/
5. Kotsons Transformers http://www.kotsons.com/
6. Mahindra Electrical Works http://www.mewindia.com
7. Marson's Electricals http://www.marsonselectricals.com/
8. P.M. Electronics Limited. http://www.indiamart.com/pme/
9. Prismatic India http://www.wind-it.com/
10. Raksan Transformers Private Ltd http://www.raksantransformers.com/
11. Roland Electronics and devices Private Ltd. http://www.redpl.com/
12. Sai Electricals http://www.saielectricals.com/
13. Tesla Transformers Limited http://www.teslatransformers.com/
14. Transformers and Electricals Kerala Limited. http://www.telk.com/
15. Transformers and Rectifiers (India) Ltd. http://www.jmtril.com
16. T.S. International http://www.transformers-reactors.com

## Green Energy Companies in India

1. **Suzlon Energy:** Suzlon is of course the first company that comes to mind. They are one of the leading wind energy companies in India are one of the better known alternative energy companies in India. Here are some details from their website.

Conceived in 1995 with just 20 people, Suzlon is now a leading wind power company with:

- Over 16,000 people in 25 countries
- Operations across the Americas, Asia, Australia and Europe
- Fully integrated supply chain with manufacturing facilities in three continents
- Sophisticated R&D capabilities in Belgium, Denmark, Germany, India and The Netherlands
- Market leader in Asia, Suzlon Market Share (Combined with REpower) rose to 9.8% thereby making Suzlon 3rd * largest wind turbine manufacturing company in the world.

2. **Orient Green Power Limited:** Primarily engaged in the Wind and Biomass energy space. Currently wind constitutes the majority of their energy portfolio, so this is another one of India's wind energy companies. As of March 31, 2010, their total portfolio of operating projects included 193.1 MW of aggregate installed capacity, which comprised 152.6 MW of wind energy projects and 40.5 MW of biomass projects. Their portfolio of committed and development projects included approximately 815.5 MW of prospective capacity, which comprised an estimated 622.0 MW of wind energy projects, 178.5 MW of biomass projects and a 15.0 MW small hydroelectric project

3. **Indowind Energy Limited:** Indowind Energy Limited is also a wind energy company that develops wind farms for sale, manages the wind assets, and generates green power for sale to utilities and corporates. Turnkey implementation of Wind Power Projects, from concept to commissioning. Wind Asset Management Solution for installed assets, including operations, billing, collection of revenue to project customers. Supply of Green Power to Customers. CERs (Carbon Credit) Sales and Trading.

4. **Suryachakra Power Corporation Limited:** SPCL is the flagship company of Suryachakra Group with interests in Power generation – renewable energy (biomass, Solar, hydro, Wind) and Clean Technology / Ultra Super Critical Thermal Power Plants (coal, Gas), Engineering Consultancy and Urban infrastructure development activities. Suryachakra Power Corporation Limited has established 3 wholly owned subsidiaries for setting up of renewable energy (biomass) power projects and also acquired stake in Sri Panchajanya Power Private limited, which was setting up a 10 MW Biomass Power Plant at Hingoli, Maharashtra.

5. **NEPC India:** This is a Public Limited Company promoted by the Khemka Group with the primary objective of promoting wind energy. This successful Group has a multi crore turnover from diversified activities in the field of Power Generation from Wind Energy and manufacture and marketing of Wind Turbine Generator (a renewable energy device).

6. **Azure Power:** Azure Power is the green energy space as it is one of the solar energy companies in India. It is a solar power company, and they are supplying power to 20,000 people in 32 villages in Punjab.

7. **AuroMira Energy:** Auro Mira is also a green technology energy company that is private, and present in the Biomass, Small Hydel and Wind Sectors. It plans to develop over 1000 MW capacity by 2012. AME is presently focusing in Biomass, Small Hydro and Wind Sectors. AME plans to invest $ 900 Million to develop, own and operate over 1000 MW in clean energy in addition to WTG manufacture and to develop over 15000 acres of energy plantation in the next five years. AME intends to foray into other clean energy technologies, solar, bio-diesel etc. in the future.

8. **Husk Power Systems:** This is truly an alternate energy company which owns and operates 35-100 kW "mini power-plants" that use discarded rice husks to deliver electricity to off-grid villages in the Indian "Rice Belt

9. **RRB Energy Limited:** This company is in the field of Wind Power Generation, and is an ISO 9001:2008 and ISO 14001:2004 certified Company. RRBEL is also an Independent Power Producer having established wind farms of aggregate megawatt capacity.

10. **Moser Baer Solar Limited:** This is a subsidiary of Moser Baer that is one of the solar energy companies as well. The Group's photovoltaic manufacturing business was established between 2005 and 2007 with the primary objective of providing reliable solar power as a competitive non-subsidized source of energy.

## Internationally renowned MNC's to offer electrical jobs

Cisco, Hewlett Packard, Intel, AMD, IBM, Ford, General Electric, General Motors, Lockheed Martin, Lucent Technologies, Moog, Micron, Motorola, Nokia, Qualcomm, Rockwell, Sun Microsystems, Atto Technology, MTI and Texas Instruments.

## Top core companies in India to offer electrical jobs

1. Bharat Sanchar Nigam Limited
2. Tata Consultancy Services
3. Bharti Airtel Limited
4. Wipro Ltd
5. Infosys Technologies Limited
6. Hewlett-Packard India
7. HCL Infosystems Limited
8. Reliance Communications Ltd
9. LG Electronics India Pvt Ltd
10. IBM India Pvt Ltd
11. Videocon Industries Ltd
12. HCL Technologies Limited
13. Satyam Computer Services Ltd
14. Siemens Ltd.
15. Samsung India Electronics Pvt. Ltd.
16. Mahanagar Telephone Nigam Ltd
17. Redington (India) Limited
18. Cognizant Technology Solutions
19. Idea Cellular Ltd
20. Videsh Sanchar Nigam Limited

## Exclusive Government jobs for Electrical Engineers

1. ISRO
2. DRDO
3. BEL
4. BHEL
5. GAIL
6. SAIL
7. HAL
8. HPCL
9. NTPC
10. ONGC
11. IOCL
12. RRB
13. ECIL
14. APGENCO
15. APTRANSCO

Ref: http://www.regencyengg.com/eee_job_offer.html

**K.L.N. COLLEGE OF ENGINEERING.**
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**
**Circular**

**Ref: KLNCE/EEE/TPO/2017** **Date: 04/05/2017**

Training plan for the Academic Year 2017-2018

| Year/TPO/ Department Activity | TPO | DEPARTMENT | STAFF |
|---|---|---|---|
| First Year | Path Transformations, ICE(Initiate Create Expose) | C,C++ Programming (Application Oriented Programming Skill is must) -3Days, BEC Training,<br>Tell About Yourself<br>TCS Campus Commune Registration(Test Portal)<br>Smart India Hackathalon<br>Code Vita, Enginx<br>Awareness on GATE,TANCET, GMAT, IES, IAS, BOAT, TOEFL, NTPC, ISRO<br>Attitude- Behavior-Dress coding-Personality-Hairstyle-Certificates Filing<br>Awareness on Profile of the Core and IT Companies<br>Direct Placement through Company Webportal<br>Awareness on Bond Rules<br>Real Time Projects | R.Divya<br>M.S.C.Sujitha<br>Mr. S. Rajalingam |
| Second Year | Level-I: Aptitude Training/ Verbal Reasoning/Quantitative Aptitude | LABVIEW,Core1,Core2,<br>C,C++ Programming(Application Oriented Programming Skill is must), MOCK Awareness, MOCK GD, Tell About Yourself, Core Training-Data Pattern-Syllabus available-EDC,LIC,DLC<br>TCS Campus Commune Registration(Test Portal)<br>Project Contest<br>Smart India Hackathalon<br>Code Vita, Enginx<br>CCNA Certification<br>Awareness on GATE,TANCET, GMAT, IES, IAS, BOAT, TOEFL, NTPC, ISRO<br>Attitude- Behavior-Dress coding-Personality-Hairstyle-Certificates Filing<br>Direct Placement through Company Webportal<br>Awareness on Bond Rules<br>Real Time Projects | M.JeyaMurugan<br>S.Manoharan<br>Dr. M. Mahalakshmi<br>Mr. S. Rajalingam |
| Third Year | Level-II: Aptitude Training/ Verbal Reasoning/Quantitative Aptitude<br>AMCAT Specific Training(Aptitude, Core, | JAVA Programming (10 Days-Even Semester)<br>C,C++ Programming (Application Oriented Programming Skill is must)<br>Texas Instruments (5 Days-Odd Semester)[Java Certification must for ZOHO, MindTree, IVTL, Salary: 6.5 | Dr. S. Venkatesan,<br>Dr. K. Gnanambal,<br>Dr. S. M. Kannan,<br>Mr. A. Marimuthu,<br>M. Ganeshkumari, |

| | | | |
|---|---|---|---|
| | Language-Syllabus available), AMCAT Exam(4 Hrs Exam-2 times)<br>Resume Preparation<br>Email writing<br>NIIT Aptitude Exam<br>TCS Webinar | Lakhs]<br>MOCK Awareness, MOCK GD, Tell About Yourself<br>Training-Data Pattern- Syllabus available-EDC,LIC,DLC<br>TCS Campus Commune Registration(Test Portal)<br>Project Contest<br>Smart India Hackathalon<br>Code Vita, Enginx<br>CCNA Certification<br>Awareness on GATE,TANCET, GMAT, IES, IAS, BOAT, TOEFL, NTPC, ISRO<br>Attitude- Behavior-Dress coding-Personality-Hairstyle-Certificates Filing<br>Direct Placement through Company Webportal<br>Awareness on Bond Rules<br>Real Time Projects | |
| Final Year | Level-III: Aptitude Training/ Verbal Reasoning/Quantitative Aptitude<br>Company Specific Training Programme<br>AMCAT Exam(4 Hrs Exam-2 times)<br>Resume Preparation, Email writing<br>MOCK Group Discussion, MOCK Interview<br>Awareness Programme for Higher Education-Abroad<br>TCS Webinar | IoT Techniques,<br>C,C++ Programming(Application Oriented Programming Skill is must)<br>MOCK GD<br>Training-Data Pattern- Syllabus available-EDC,LIC,DLC,VLSI,MPMC,ES,DSP<br>Jasmin InfoTech- C, C++,MPMC,DSP-Application Oriented<br>CADENCE – CT(Salary: 8 Lakhs)<br>TESSOLVE- EDC, LIC, DLC (Semiconductor Based)<br>LABVIEW- CLAD Certification<br>TCS Campus Commune Registration(Test Portal)<br>Project Contest<br>Smart India Hackathalon<br>Code Vita, Enginx<br>CCNA Certification, Oracle Certification<br>Awareness on GATE,TANCET, GMAT, IES, IAS, BOAT, TOEFL, NTPC, ISRO<br>Attitude-Behavior-Dress coding-Personality-Hairstyle-Certificates Filing<br>Direct Placement through Company Webportal, Awareness on Bond Rules<br>Real Time Projects | Dr. A.S.S. Murugan<br>M. Jegadeesan<br>R. Jeyarohini<br>A. Manoj<br>N.Vimal Radha Vignesh |

www.guvi.com - **Real Time problem and Programming Skill**

**ANNA UNIVERSITY**

**CENTRE FOR UNIVERSITY INDUSTRY COLLABORATION (CUIC)**

# A READY RECKONER FOR ENHANCING PLACEMENT ACTIVITIES

**Dr. T .Thyagarajan, Director- CUIC**

## ROLES AND RESPONSIBILITIES OF PLACEMENT REPRESENTATIVES

- Collect list of HR contact details through your friends / relatives / Newspaper / Faculty members / Seniors / Alumni
- Pass on the HR Contact details to Placement Officer for sending official invitations
- Ensure Placement Officer contact details in all the Department Brochures, to have single point contact
- Keep the hard and soft copies of Curriculum and Syllabus
- Keep the contact details (Email, Landline No. & Mobile No.) of all your classmates
- Keep the complete details about each student (SSLC, HSC, Semester wise GPA, CGPA, DOB, Community, History & Current Arrears)
- Keep the contact details of other Placement Representatives
- Generate comprehensive Question Bank ( Both Technical and Non-Technical)
- Collect Aptitude Questions / GD Topics / Interview Questions to create Question Bank
- Give training to the needy students
- Avoid spreading Rumors / False / Assumed information (This will lead to black listing)
- Avoid accepting false information / Track records from students (This will lead to rejection of offer)
- Avoid arguing with company HRs about previous year's branch preferences

## TIPS TO FACE INTERVIEWS

- Maintain Professional Ethics and Moral Standards
- Read Frequently Asked Questions by interviewers and prepare the answers and practice them
- Prepare a Comprehensive Resume
- Practice with Mock Aptitude Test / Mock GD / Mock Interview etc.,
- Prepare well in fundamental & core subjects of respective branches
- Update database after declaration of revaluation / Aarrear result
- View the placement Notice Board regularly
- As for as possible change of contact details should be avoided
- Visit the company's website before attending the Pre Placement Talk (PPT) to get clear idea
- Avoid Wearing Jeans / T-shirts/ Cheppal / Half sleeves
- Be punctual for PPT as well as for Test / Interview
- Avoid standing outside or near the PPT hall
- Occupy first benches also, during the PPT
- Maintain Gender separation during the PPT
- Maintain discipline during PPT
- Avoid coming late to the PPT/test/interview
- Ask only relevant / valid questions during the PPT
- Carry Pen, Pencil, Eraser, Passport Size Photograph etc., for the test
- Avoid contacting the HR directly. It should be through CUIC only.
- Carry Resume / Copy of Mark Sheets / Community / Co-curricular / Extra-curricular Certificate etc for the interview
- Bring OBC Certificate for PSU interview
- Bring doctor certificate for differently abled physique
- Inform at the beginning itself about colour blindness, hearing disorder to avoid disqualification at the end.
- Attend the interview with clean dress (tucked-in) and neatly shaved to maintain dignity and decorum
- Wish the interviewer while entering the room. Thank the interviewer before leaving the room
- During the interview, relax and avoid showing your nervousness obvious
- Speak loudly, clearly; sit up straight; try to look at the interviewer's eyes when you speak to him/her
- Be honest in your approach
- Keep your answers brief and to the point.
- Do not give 'YES' or 'NO' replies.
- Don't discuss your personal difficulties
- Show your enthusiasm and willingness
- Exhibit your skills and abilities.

- Avoid passing bad comments /Remarks about the College/ University/ Staff during the interview
- Prepare in advance, the questions you want to ask about the job and company
- Be available till the announcement of results
- Maintain silence during announcements of results
- Do not exhibit bad mannerism during the placement activity

## FREQUENTLY ASKED QUESTIONS (FAQ)

- Tell me about yourself
- What are your long range goals, ambitions, future plans?
- What do you want to be doing 5 or 10 years from now?
- How do you feel that you can contribute to this job?
- What are your hobbies?
- What are your strengths? Your weaknesses?
- What are your big accomplishments?
- What are your special abilities?
- Why you think that you are suitable for this kind of job?
- What is your career goal?
- What do you know about our company?
- Why are you applying for a job with us?
- What salary do you expect?
- Do you have any plans to go back to school?
- What kind of job profile you enjoy the most, the least and why?
- I have interviewed others for this job, why should I give you the job?
- Would you be willing to take an aptitude test?
- Can you tell me anything about yourself that you think I might want to know?
- What is the lowest salary you would accept?
- Can you handle criticism? How do you deal with it?
- Do you have any questions?

## H.R. EXPECTATIONS

- Sincerity and honesty in the answers
- Attentiveness in listening to the questions
- Body language: gesture, posture, eye contact and confidence level
- Stress handling capability
- Positive approach in answering the questions
- Exhibition of skills, accomplishments and talents
- Enthusiasm and motivation level
- Command over communication skills
- Willingness and positive approach
- Exhibition of talents and accomplishments

## POINTS DECIDED BY THE ORGANISATION

- Interview time and venue
- Decision on allowing identical branches
- Execution of Bond
- Change in eligibility criteria
- Place of work
- Percentage cut-off/ history of arrears / standing arrears
- Postponement of dates/ cancellation
- The number of recruits, on-board date

**USEFUL WEBSITES FOR APTITUDE, GD, TECHNICAL & HR INTERVIEW**

http://www.indiabix.com
http://www.freshersworld.com
http://www.placementpapers.net
http://www.allinterview.com
http://www.geekinterview.com
http://www.careersvalley.com
http://www.sampleplacementpapers.com
http://www.chetanasinterview.com
http://www.ittestpapers.com
http://www.indianfresher.com
http://www.freeplacementpapers.com
http://www.educationindiaworld.com
http://www.jobsnresults.com
http://www.psychometric-success.com
http://testfunda.com http:/www.test4free.com
http://www.placementexpress.com

**TECHNICAL**

http://www. mechanicalengineeringblog.com
http://www.indiabix.com

**USEFUL WEBSITES FOR ENGLISH COMMUNICATION**

http://www.nonstopenglish.com http://www.talkenglish.com
http://www.freeenglishnow.com http://www.ego4u.com
http://www.focusenglish.com
http://www.bbc.co.uk/worldservice/learningenglish
http:/www.englishclub.com http://www.easyenglish.com
http://learnenglish.britishcouncil.org englishbee.net
http://www.english4today.com/free_content.cfm
http://www.english-the-international-language.com
http://www.teachingengtish.org.uk http://esl.about.com
http://www.learnenglish.de
http://www.busuu.com http://free-
esl.com

**'FACTS' TO PERFORM WELL IN THE PLACEMENTS**

**F** - Clear the subjects in **F**irst attempt

- Learn **F**oreign Language (German, Japanese, French, Chinese)

**A** - Have right **A**ttitude

**C** - Have good **C**ommunication Skills

Maintain a **C**GPA above 7.5

**T** - **T**hink Positive

Develop creative **T**hinking

**S** - Be **S**agacious. Express your wisdom and Exhibit your Talents

**K.L.N. COLLEGE OF ENGINEERING**
**POTTAPALAYAM - 630 612 (11KM from Madurai City)**
**SIVAGANGAI DISTRICT, TAMILNADU, INDIA**
**(Sponsored by K.L.N. Sourashtra College of Engineering Council)**
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**Ph: 0452 – 6562171 & 2, 0452 – 2090971 & 2, Fax: 0452 – 2090070, Email –** info@klnce.edu

## COURSES OFFERED

### UG COURSES - B.E. / B.TECH

1. Mechanical Engineering (Accredited by NBA)
2. Electrical & Electronics Engineering (Accredited by NBA)
3. Electronics & Communication Engineering
4. Computer Science & Engineering (Accredited by NBA)
5. Information Technology (Accredited by NBA)
6. Automobile Engineering
7. Electronics & Instrumentation Engineering

### PG COURSES

1. Master of Computer Applications (Accredited by NBA)
2. Master of Business Administration
3. M.E. – CAD / CAM
4. M.E. – Communication Systems
5. M.E. – Power Systems Engineering
6. M.E. – Computer Science & Engineering
7. M.E. – Computer Science & Engineering (with Specialization in Networks)