

**CE/CS / EB/ EC /EE/ EI/IT/ ME/SE 301 ENGINEERING MATHEMATICS II**

**Module I**

**Matrices and Vector spaces:** Rank of matrix, Echelon and normal form, Solutions of linear systems of algebraic equations, Eigen values and Eigen vectors, Cayley- Hamilton theorem (no proof).

Vector Spaces- Subspaces,-Linear Independence of vectors-Linear span-Dimension and Basis. Linear transformations.

**Module II**

**Fourier series and Fourier integrals:** Fourier series of Periodic functions-Euler formulae for Fourier coefficients- functions having period  $2\pi$  , arbitrary period- even and odd functions-half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

**Module III**

**Laplace transforms:** Linearity property, transforms of elementary functions, Laplace transforms of derivatives and integrals, differentiation and integration of transforms, convolution theorem (no proof), use of Laplace transforms in the solution of initial value problems, unit step function, impulse function - transform of step functions, transforms of periodic functions.

**Module IV**

**Vector calculus:** Scalar and Vector point functions-Gradient and directional derivative of a scalar point functions. - Divergence and Curl of a vector point functions- their physical meanings. Evaluation of line integral, surface integral and volume integrals, Gauss's divergence theorem, Stoke's theorem (No Proof of these theorem), conservative force fields, scalar potential.

**Text books:**

1. R.K.Jain, S.R.K.Iyengar, *Advanced Engineering Mathematics*, Narosa Publishers.
2. C.R.Wilie & L.C.Barrett, *Advanced Engineering Mathematics*, McGraw Hill Publishers

**References :**

1. Larry C Andrews,Ronald C Philips, *Mathematical Techniques For Engineers & Scientists*, Phi Publishers
2. M.C.Potter, J.L.Goldberg, *Advanced Engineering Mathematics*, Oxford University Press
3. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publishers

**Type of questions for University Examination**

**Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module**

**Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks**

## EB/ EC / EI/IT/ ME 302 ELECTRICAL TECHNOLOGY

### Module I

**Transformers:** working principle and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram, equivalent circuit, impedance transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer - working principle and saving copper, basic idea of current transformer and potential transformer, distribution and power transformer, applications, standard rating, IS specifications.

### Module II

**Basic principles of electrical machines:** Concepts of motoring and generating action,  
**DC machines-** Main constructional features, principles of operation, types of generators, emf equation, characteristics, applications, armature reaction and commutation, types of motors, torque, speed, and power, characteristics, applications, starting losses, and efficiency, speed control, testing, load test of dc machines.

### Module III

**AC Machines:** Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, characteristics, emf equation, losses and efficiency, regulation (emf method only), applications, synchronous motor- principle of operation, over excited and under excited, starting, applications, synchronous capacitor.  
**Induction Motor:** Three phase induction motor, principles of operation, and constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.  
**Single phase induction motor:** Principle of operation, types of single phase induction motors

### Module IV

#### **Generation, transmission & distribution of electrical energy:**

Different methods of power generation- thermal, hydro-electric, nuclear, diesel, gas turbine stations (general idea only), electrical equipments in power stations, concept of bus bar, load dispatching, methods of transmission, transmission lines, overhead lines and insulators, corona and skin effect of DC & AC distribution, substation (elementary idea only)

#### **Text Books:**

1. F.S.Bimbira, *Electrical Machines*, Khanna publications

#### **References:**

1. B.L.Theraja, *Electrical Machines*, vol I & IV, Khanna Publishers
2. H.Cotton, *Advanced Electrical Technology*, Wheeler publications.
3. Nagarath & Kothari, *Electrical Machines*, Tata McGraw Hill

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*Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks*

## EC/EI 303 NETWORK THEORY

### Module I

Review of basic Circuit Concepts and theorems, Passive circuit components, Sources, Standard input signals; Source transformation, Mesh and Node analysis, Network equation for RLC Circuits  
Graph of a Network, Trees, Co-trees and loops, Incidence matrix, Cut-set Matrix, Tie-set Matrix and loop currents, Analysis of Networks

### Module II

Characterization of two port networks using different parameters; Interconnections of two port Networks, T &  $\pi$  representation; Steady state and transient response, DC and sinusoidal response of RL, RC and RLC circuits, Initial conditions, Rise and decay of current, Time constant, Damping.  
Laplace Transforms – Concept, Laplace transform of important Network functions; Transfer function of two port networks, poles and zeros; Application of Laplace Transforms – Solutions of Network Problems.

### Module III

Passive filters – Filter fundamentals, Classification of Filters- Low Pass, High Pass, Band Pass & Band Reject Filters. Characteristic impedance, Design of Constant K and m derived filters (all four)- T and  $\pi$  - frequency response, Recursive filters- Butter worth, Chebyshev & Elliptical filters (Concept only)-Frequency response, transfer function.

### Module IV

Transmission Lines: Types, Applications, Equivalent Circuit, Primary constants, Transmission Line equations, Input impedance, Secondary Constants, Lossless Line, Distortion less line, Loading of lines, Input impedance of lossless Transmission line, RF lines, Relation between Reflection Coefficient, Load, Characteristic impedances and VSWR, Lines of Different Length -  $\lambda/8$ ,  $\lambda/4$  and  $\lambda/2$  Lines, Losses in Transmission Lines, Smith Chart and applications, Impedance matching – Single stub & double stub properties

### Text Books:

1. D.Roy Choudhury, *Networks and systems*, Wiley Eastern
2. A.Sudhakar and ShyamMohan. S. Pillai, *Circuits and Networks–Analysis and Synthesis* , Tata McGraw Hill, 2002
3. Ryder, *Network Lines and Fields*, Prentice Hall India, 3<sup>rd</sup> edition
4. G.S.N Raju, *Electromagnetic Field Theory and Transmission Lines*, 2005

### References:

1. William B.Stanley, *Network Analysis with applications*, Pearson Education. 4<sup>th</sup> edition
2. A.Usha Nandini and A.Aravamudan, *Network Theory*, Scitech Publishers, 2004.
3. Dr.D.Ganesh Rao & R.V.Srinivasa Murthy, *Network Analysis – a simplified approach*, Sanguine publishers ,2005.
4. Bruce Carlson, *Circuits*, Thomson Learning, 2006
5. Boylestead, *Introductory Circuit analysis*, 5<sup>th</sup> Ed.,UBS, 2003.
6. DeCarlo / Lin, *Linear Circuit Analysis*, - Oxford University Press, 2005.
7. *Schaum's 3000 solved Problems in Electric Circuits, Book 1,2* ,McGraw Hill

### Type of questions for University Examination

**Question 1** - 8 short answer questions of 5 marks each. 2 questions from each module

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## EB/EC/EI 304 DIGITAL ELECTRONICS

### Module I

**Number system and codes :** Binary , Octal, and Hexadecimal number systems - Binary arithmetic, Binary coded Decimal , Excess - 3 code, Gray Code, Error detection and correction - Boolean algebra -Minimization of Boolean function using Karnaugh Map and Quine - McClusky methods – Formation of switching functions from word statements , realisation using NAND, NOR. Combinational circuits- multiplexer demultiplexer, decoder, encoder

### Module II

**Sequential circuits:** Flip-flops - RS, JK & T & D flip- flops, shift registers - counters -Asynchronous and synchronous counters, Up-Down counter, modulo counter, Ring counter, Johnson counter - sequence generators - state tables and diagrams

### Module III

**Arithmetic circuits :** Half adder, Full adder , Subtractor, Serial and parallel addition - Carry look ahead adder - Binary multiplication and division - Multivibrators - Monostable and astable multivibrators using discrete gates . Memories –ROM, RAM, EPROM

### Module IV

**Logic families:** DCTL, RTL, DTL, TTL, ECL, CMOS - Tri-state logic - specification and transfer characteristics of basic TTL - Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, noise consideration- interfacing of CMOS to TTL and interfacing of TTL to CMOS

### Text Book:

1. A. Anand Kumar, *Fundamentals of Digital Circuits*, Prentice-Hall India Ltd, 3<sup>rd</sup> edition.

### References :

1. J.M.Yarbrough, *Digital Logic, Applications & Design*, Thomson Learning, I edition
2. Flyod & Jain, *Digital Fundamentals*, Pearson Education, 8<sup>th</sup> Edition,
3. R P Jain, *Modern Digital Electronics*, Tata Mc Graw Hill
4. R. K. Gaur, *Digital Electronics and Microcomputers* , Dhanpat Rai and Sons ,3<sup>rd</sup> Edition.
5. Taub & Schilling, *Digital Integrated Electronics*, Mc Graw Hill
6. Malvino and Leach, *Digital Principles and Applications*, Mc Graw Hill
7. Charles H.Roth , *Fundamentals of Logic Design*, Thomson Publishers, 5<sup>th</sup> ed.

### *Type of questions for University Examination*

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## EC/EI 305 SOLID STATE ELECTRONICS

### Module I

**Band theory of solids** - Conductors, semiconductors and insulators - energy band diagram. -Semi conductor materials and their properties: elemental semiconductors- the energy band model of semiconductors. Valance band model of semiconductor equilibrium concentration of electrons and holes- the fermi level and energy distribution of carriers inside the bands- temperature dependence of carrier concentration inside the bands. - Carrier transport in semi conductors - drift of carriers in electric fields, carrier flow by diffusion - constancy of fermi level across junction, Excess carriers in semi conductors - injection of excess carriers - recombination of excess carriers - continuity equation - current flow equation.

### Module II

**PN junction**- Abrupt PN junction - energy band diagram - barrier potential, biasing PN junction, excess carrier calculation - current components diffusion - drift - boundary conditions for long and short diodes - PN junction characteristics - calculation of diffusion – depletion layer capacitance - simple model - transient ac condition - principle of zener and avalanche diodes - photodiodes - - tunnel diode and PIN diode -varactor diode.

### Module III

**Bipolar junction transistors** - NPN, PNP types, Basic structures - biasing - mechanism of carrier flow - current components in transistors boundary conditions in active region - solution for short base width - base width modulation - Transistor configurations - Characteristics - current amplification factors - relations between alpha & beta - comparison Ebers - Moll model - - basic principles of phototransistors - UJT, characteristics. Semiconductor heterojunctions - V-I characteristics - real heterojunctions - frequency limitation of transistor - transit time effect

### Module IV

**Field effect transistors:** JFET - basic structures - principle of operation - Characteristics and current equation, MOSFET - semiconductor surfaces - C - V characteristics - the Si - SiO<sub>2</sub> System - basic structures and operating principles - current equation - V-I characteristics - simple model – CMOS- structure, operation.

### Text Books:-

1. B.G.Streetman , *Solid State Electronics Devices*, Pearson Education,
2. Suresh Babu ,*Solid State Devices & Technology*, Sanguine Tech. Publishers

### References

1. *Electronic Devices* , Learning Material Series, ISTE, NewDelhi ,1997
2. Millman & Halkias ,*Electronic Devices & Circuits*, Mc Graw Hill
3. George B Rutkowski ,*Solid state electronics*, Mc Graw Hill ,IV<sup>th</sup> edition
4. S.S.Islam, *Semiconductor Physics and Devices*, Oxford University Press, 2006
5. Dr. Achuth & Dr. K.N.Bhatt, *Solid State Devices*, Tata Mc Graw Hill

### Type of questions for University Examination

**Question 1** - 8 short answer questions of 5 marks each. 2 questions from each module

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## EC/EI 306 ELECTRONIC CIRCUITS I

### Module I

**DC power supplies** - power transformers - rectification - half wave, full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. Filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers - dual power supplies - simple voltage regulator. Series regulators - IC regulators.

### Module II

**BJT Amplifiers:** Units of gain, CE amplifier- Biasing techniques - stabilization of operating point –compensation techniques- low frequency equivalent circuits - r-parameters, h-parameters Methods of coupling - D.C coupled amplifier - CE RC coupled amplifier - concept of load lines- loading effect at the input and output - emitter follower as Buffer stage- Darlington emitter follower-Boot strapping – High frequency equivalent circuit of CE amplifier-hybrid  $\pi$  model - frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth - Frequency response of DC coupled amplifier.

### Module III

**FET Amplifier:** FET biasing- Low frequency equivalent circuit- RC coupled common source amplifier - expression for gain - frequency response - FET source follower- - FET as a voltage variable resistor –comparison of FET with BJT. CMOS biasing-Amplifier ckts, Multistage Amplifier.

### Module IV.

**Pulse circuits:** pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits - clipping and clamping circuits using diodes and transistors - Transistor as a switch- sweep circuits - Transistor sweep circuits - voltage and current sweep - Miller sweep circuit - Bootstrap sweep circuit - UJT relaxation oscillator. Multivibrators using transistors - astable - monostable and bistable operation

### Text books:

1. Boylsted & Nashelsky, *Electronic Devices and circuits'* , Pearson Education, 9<sup>th</sup> edition.
2. Bogart , *Electronic Devices and circuits* , Pearson Education, 6<sup>th</sup> edition.
3. Milman & Taub , *Pulse Digital & Switching waveforms* , Tata Mc Graw Hill

### References:

1. Milman & Halkias, *Integrated Electronics* , Tata Mc Graw Hill
2. Sedra & Smith , *Microelectronic circuits*, Oxford University Press, 5<sup>th</sup> edition.
3. Schilling & Belove, *Electronic Circuits, Discrete & Integrated* , Tata Mc Graw Hill
4. *2000 Solved problems in Electronics: Shaum series*, Mc Graw Hill Publishers, 1990
5. Allen Mottorshed, *Electronic Devices & Circuits* , Prentice Hall of India, 2003

*Type of questions for University Examination*

*Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module*

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### EB/EC/EI 307 BASIC ELECTRONICS LABORATORY

1. Study of - Multimeter, Signal generators , CRO etc. and measurement of electrical quantities (V,I,FREQUENCY,PHASE)
2. Testing of Passive and Active components - Resistors , Capacitors, inductors , Transformers , diodes , Transistors, etc.
3. Characteristics of Active devices
  - i) Forward and reverse characteristics of a diode - measurement of forward resistance
  - ii) Common base characteristics of a transistor - measurement of current gain, input resistance and output resistance, maximum ratings of the transistor.
  - iii) Common emitter characteristics of a transistor - measurement of current gain, input Resistance and output resistance, relation between and study of the effect of leakage Current, maximum ratings of the transistor.
  - iv) Common source characteristics of a JFET - measurement of transconductance  $g_m$  and drain to source resistance  $r_{ds}$  , use of FET as VVR.
4. Rectifying circuits
  - i) HW rectifier
  - ii) FW rectifier
  - iii) FW Bridge rectifier
  - iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter  
( Measurement of ripple factor, maximum ratings of the devices )
5. Zener Regulator
6. Design and implementation of Power supplies
7. Biasing of Active devices
  - i) Voltage biasing, current biasing and Feedback biasing of BJT
  - ii) Biasing of JFET
8. Series Voltage Regulator using transistors.

**Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.**

**EB/EC/EI 308 ELECTRICAL MACHINES LABORATORY.**

***Compulsory experiments***

1. (a) Preliminary study of AC and DC Power supplies in the laboratory.  
(b) Study of instruments and their mode of use
2. Open circuit characteristics of  
(a) Self excited generator  
(b) Separately excited generator.
3. Load characteristic of compound generator
4. Load characteristic of shunt generator
5. Study of face plate starter and starting of DC motors
6. Load characteristics of DC series motor.
7. Swinburn's test
8. Polarity and transformation ratio test on single phase transfer.
9. O.C & SC test on single phase transformer - equivalent circuit
10. Load test on single phase transformer.
11. Study of starting methods of squirrel cage and slip ring induction motor.
12. Load test on slip ring induction motor and study of characteristics.

***Optional Experiments***

1. Study of single-phase motors.
2. Load test of DC shunt motor.
3. Poly phase connection of single phase transformer.
4. Load test on squirrel cage induction motor
5. Study of alternators.

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