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 2π, 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 for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE302 FLUID MECHANICS & HEAT ENGINES

Module I

Fluids and their properties: Fluids, shear stress in a moving fluid, viscosity, Newtonian and non-Newtonian fluids, viscosity in liquids and gases. Fluid statics: pressure, variation of pressure in a static fluid, absolute and gauge pressure, measurement of gauge pressure.
Kinematics of fluid flow: Eulerian and Langragain approaches, classification of fluid flow as steady and unsteady flow, uniform and non uniform flow, laminar and turbulent flow, Path line, stream line, streak line and stream tube, one, two, and three dimensional flow, velocity and accelerations in steady and unsteady flow. **Basic Hydrodynamics:** Ideal fluids, equations of continuity in the differential form, rotational and irrotational flow, circulation and vorticity, Stream function, Velocity potential, one dimensional flow along a stream line, Bernoulli's equation and its limitations, measurement of velocity, Pitot tube and Pitot-static tube, venturi meter, orifice meter, flow nozzles, notches and weirs.

Module II

Steady flow of incompressible fluids in pipes: Laminar and turbulent flows, critical Reynolds number, hydraulic radius, general equation for friction, laminar flow in circular pipes, Darcy- Weisbach equation, friction factor, equivalent pipes, minor losses in pipes, Development of boundary layer. **Dimensional Analysis & Similitude:** Rayleigh's method, Buckingharm's Pi theorem, nondimensional parameters in fluid mechanics and machinery – principles of similitude – geometric, kinematic and dynamics similarities – model studies. Physical meaning of important dimensional groups of fluid mechanics and their practical use.

Module III

Dynamic action of fluid: Momentum equation applied to a control volume, impact of jets, flow of an incompressible fluid over fixed and moving vanes, work done and efficiency.
Hydraulic turbines: velocity triangles, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine, their constructional features and performance characteristics – non dimensional parameters for comparative study of turbine performance, theory of draft tubes, speed regulation of turbines, selection of type and speed of turbines.

Module IV

Pumping machinery: general features of positive displacement and rotodynamic pumps, cetrifugal pumps, classification, principle of working, velocity diagrams, losses in pumps, circulatory flow, multistage pumps, propeller pumps, priming, cavitation and its significance.
Reciprocating pumps: Acceleration head, effect of friction, use of air vessels, efficiencies, pump characteristics.

References:

Douglas, Gasiorek, and Swaffield: Fluid mechanics – Pitman
Daugherty & Franzini: Fluid mechanics with Engg.Applications Mc Graw Hill
Dr. Jagdish Lal: Hydraulic mechanics, Metropolitan book Co. Delhi-6
N.S Govinda Rao: Fluid flow mechanics - Tata Mc Graw Hill.
F.M White: Fluid Mechanics.
Vallentine: Applied hydrodynamics – Butter worths – London.
Massery : Fluid Mechanics – ELBS
K.L Kumar: Engineering fluid mechanics – Eurasia publishing house, New Delhi.
Herbert Addison: A Treatise on applied hydraulics.
A.J Stepanof : Centrifugal and axial flow pumps, Wiley, Newyork.
D.G Shepherd : Principles of turbo machinery – Mac Millan publishing Co. Inc.
Som & Biswas : Introduction to fluid Mechanics & Machinery (TMH)
Agarwal: Fluid mechanics & Machinery, TMH.

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CE/EE 303 STRENGTH OF MATERIALS

Module I

Tension, Compression and Shear : Normal stresses and strains – Mechanical properties of mild steel – Elasticity, plasticity and creep – Liner elasticity, Hooke's law and Poisson' s ratio – Shear stress and shear strain – Allowable stresses and allowable loads – design for axial loads and direct shear

Axially loaded Members : Changes in lengths of axially loaded members – Changes in lengths of nonuniform bars – Thermal effects, misfits and prestrains – stress on inclined sections – strain energy

Module II

Torsion : Torsional deformation of circular bar – Circular bars of linearly elastic materials – nonuniform torsion – stresses and strains in pure shear – relationship between modulus of elasticity, bulk modulus and rigidity modulus – transmission of power by circular shafts – Circular shafts fixed on both ends – strain energy in torsion and pure shear

Shear forces and bending moments: Types of beams, loads and reactions – shear forces and bending moments – relationships between loads, shear forces and bending moments – Shear force and bending moment diagrams

Module III

Stresses in beams : Pure bending and non uniform bending – Curvature of a beam – Longitudinal strains in a beam – Normal stresses in beams (linearly elastic materials) – Design of beams for bending stresses – Nonprismatic beams – Shear stresses in beams of rectangular cross section – Shear stresses in beams of circular cross section – Shear stresses in webs of beams with flanges

Analysis of stress and strain : Plane stress – Principal stresses and maximum shear stresses – Mohr's circle for Plane stress – Hooke's law for plane stress – Maximum stresses in beams – Plane strain

Module IV

Deflection of determinate Beams : Differential equation of deflection profile – Deflection by integration of the bending moment equations – Deflection by integration of the shear-force and load equation – Method of superposition – Moment area method

Columns : Buckling and stability – Columns with pinned ends – Columns with other support conditions – Columns with eccentric axial loads – The secant formula for columns

Text Book

Gere J M. – Mechanics of Materials, Brooks/Cole Thomson Learning.

Reference

Wang C.K – Intermediate Structural Analysis, McGraw Hill International Edition

Pytel.A& Kiusalaas J. – Mechanics of Materials-, Brooks/Cole Thomson Learning

Popov E.P- Engineering Mechanics of Solids, Printice-Hall of India Limited, New Delhi,

Timoshenko S.P. and Young D.H - Elements of strength of materials, East-West Press Private Limited New Delhi, India.

Nash – Strength of Materials – Shausm's OUTlines, McGraw Hill

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EE 304 ELECTRIC CIRCUIT THEORY

Module I

Review of network theorem – superposition, reciprocity, Thevenin's, norton's, maximum power transfer theorem mesh and node analysis by inspection – network topology – definition of graph, tree, incidence matrix, curset, tie set, application of graph theoretic methods to formulation of network equation – current variable and voltage variable methods.

Module II

Coupled circuit – self and mutual inductance analysis of coupled coils – dot rule – conductively coupled equivalent circuits – coupling coefficient – linear transformer – ideal transformer.
Two port networks - characterization in terms of impedance, admittance, hybrid and transmission parameters – inter relationship among parameter sets – reciprocal and symmetrical two port networks – inter connection of two port network – I and II equivalent of a two port network – image impedance – characteristic impedance and propagation constant of a symmetrical two port network.

Module III

Polyphase systems – balanced and unbalanced loads – unbalanced three wire and four wire star connected load – displacement neutral method – power measurement using wattmeter.
Circuit transients – direct current transients - RL, RC, RLC transients – alternating current transients – application of laplace transform for transients analysis.

Module IV

Fourier method of waveform analysis – frequency spectrum of periodic signals – trigonometric fourier series – exponential fourier series.
Fourier transform and inverse fourier transform – properties of fourier transforms – continuous amplitude and phase spectra.
Filters – analysis of constant K and derived filters.
Network synthesis – foster and cauer forms.

Text Book

1. *Theory & problems of electric circuit, Schaum's outline series* – Joseph. A.Edminister, Tata McGraw Hill edition.

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EE 305 ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Module I

General Principles of Measurements, Standards: Absolute and Working Standards, Calibration of Meters, Qualities of Measurements, Characteristics, Errors in Measurement and its Analysis, Direct Deflecting Instruments. Moving Coil, Moving Iron, Dynamo Meter, Induction, Thermal, Electrostatic and Rectifier Type, Shunts and Multipliers, Various Types of Galvanometers.

Module II

Measurement of Current, Voltage and Resistance, Measurement of Insulation Resistance, Earth Resistance, Earth Tester; Measurement of Power and Energy, Dynamometer Type Wattmeter, Error and Compensation, Ampere Hour Meter, Single and Three Phase Energy Meters (Induction Type), Calibration, Trivector Meter, Frequency Meters, Power Factor Meters, Current Transformers and Potential Transformers.

Module III

Null Deflection Method – Measurement of Resistance; Current, Voltage and Power – Direct Current Potentiometer-Wheatstone Bridge-Kevin Double Bridge-Carry Foster Slide Wire Bridge-Bridge Current Limitations-Localization of Cable Fault by Murray and Varley Loop Tests-A.C Potentiometers-Various A.C Bridges and Measurement of Inductance & Capacitance; Magnetic Measurements: Classification-Measurement of Flux and Permeability-Hibbert's Magnetic Standard –Flux Meter, Hall Effect Gauss meter, Ballistic Galvanometer, Calibration-Vibration Galvanometer-B.H. Curve and Permeability and Measurement on bar and ring specimens-Hysteresis Measurement- Core Loss Measurement with Lloyd Fishes square

Module IV

Illumination: Laws of Illumination- Polar Curves- Photometry- Luminous Efficiency- Measurement of Illumination of Different Light Sources- Illumination of Surfaces- Levels of Illumination; Digital Measurements and Meters; Oscilloscope- Basic Principle of Signal Display- Triggered Sweep CRO- Trigger Pulse Circuit- Delay Line in Triggered Sweep- Sync- Selector for continuous Sweep CRO- Dual Beam CRO- Dual Trace Oscilloscope-Applications.

Reference:

1. A.K Sawhney - *A course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Sons.
2. Golding E.W - *Electrical Measurements & Measuring Instruments*, Wheeler Pub.
3. Cooper W.D - *Modern Electronics Instrumentation*, Prentice Hall of India.
4. Stout M.B - *Basic Electrical Measurements*, Prentice Hall.
5. Oliver & Cage - *Electronic Measurements & Instrumentation*, McGraw Hill.

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CS/EB/EE 306 ELECTRONIC DEVICES & CIRCUITS

Module 1

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 - zener and avalanche diodes - simple and series voltage regulator. *Special semiconductor devices:* Principles and operation of photodiodes, PIN diodes, phototransistors, LED, UJT. MOSFET**-** basic principles & characteristics.

Module 2

Small Signal amplifiers: Bipolar junction transistor – configurations, characteristics - current amplification factors - relations between alpha & beta – comparison. *BJT amplifiers*: Biasing techniques of BJT- stabilization of operating point - h-parameters - CE RC coupled amplifier - concept of load lines- frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth.

FET Amplifiers: Principle of operation, characteristics, Common source amplifier-design, frequency response-applications

Module 3

Power amplifier - classification - class A, B, AB and C power amplifiers-tuned amplifier-pushpull and complementary symmetry power amplifier –Harmonic distortion– Heat sinks.

Feed-back amplifiers: concept of Negative and positive feedback – Bark Hausen criteria -low frequency sinusoidal oscillators

High frequency oscillators – types- LC, Crystal oscillators –circuit diagram-description-applications

Module 4

*Pulse Circuits***:-**Different types Pulse circuits - pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits –applications. Clipping and clamping circuits using diodes - *Transistor as a switch*– simple sweep circuits-bootstrap sweep.

Multivibrators-astable, monostable and bistable ciruits using BJTs-applications

Text book:

Boylestead & Neshelsky: ,"Electronic Devices & Circuit Theory", PHI2003
Millman & Halkias, "Electronic Devices & Circuits", TMH, New Delhi.1996
Taub & Schilling, Pulse, Digital and Switching ciruits, TMH, New Delhi

References:

Bapat Y N, "Electronic Devices & Circuits", Tata McGraw Hill, New Delhi.1995
Allan Mottorshed, " Electronic Devices & Circuits", PHI, New Delhi.
Schilling & Belove "Electronic Circuits, Discrete & Integrated", TMH, New Delhi 1989
Theodore F.Bogart: "Electronic Devices & Circuits" Universal Book Stall, New Delhi 1992

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CS/EE 307 ELETRONIC CIRCUITS LAB

1. Study of Multimeter, Signal generators, CRO etc. and measurement of electrical quantities
2. Testing of Passive and Active components - Resistors, Capacitors, inductors, Transformers, diodes, Transistors, etc.
3. Characteristics of Active devices
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)

Differentiating circuit and integrating circuit.

6. Clipping & Clamping circuits.
7. Amplifying circuits Simple common emitter amplifier configuration - gain and bandwidth.
8. Oscillators –
9. Multivibrators – A stable only.
10. Circuits using OP- Amps

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

EE 308 BASIC ELECTRICAL ENGINEERING LAB

1. Determination of the voltage-current characteristics of linear resistance and an incandescent lamp
2. Measurement of linear resistance using voltmeter and ammeter.
3. Potential divider connection of rheostat and dependence of output voltage upon the value of the load resistance.
4. Study of PMMC and MI voltmeters and ammeters, dynamometer type wattmeter, clip on ammeter, standard symbols on the dials of the meters
5. Verification of Kirchoff's laws using rheostats.
6. Verification of superposition theorem in a resistive circuit with two given d.c. sources.
7. Verification of Thevenin's theorem in d.c. circuits.
8. Verification of generalized Reciprocity theorem in a d.c. circuit.
9. RLC series parallel circuit – Measurement of current in various branches and verification by calculation – drawing Phasor diagram.
10. Study of voltage – current relationship of series circuit with given RLC elements and condition for series resonance.
11. Determination of fusing time versus current characteristics for two specimens – Fusing factor – study of various types of fuses.
12. Single-phase power measurement using a wattmeter – determination of thermal efficiency of a kettle.
13. Measurement of power in three-phase circuits.
    a) Single wattmeter method.
    b) Two wattmeter method.

Student shall present his/her fair record, notebook duly certified by the Head of the Department, to the examiners at the time of University practical examination.

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