

CE/ME/EC/CS/SE/IT/EB/EI 301 ENGINEERING MATHEMATICS 1I

MODULE 1

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 (non proof).

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

MODULE II

Fourier series and Fourier integrals: Forier 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 function- 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

Advanced engineering mathematics: R.K.Jain, S.R.K.Iyengar, Narosa Publishers.

Advanced engineering mathematics: C.R.Wilie & L.C.Barrett, Mgh

REFERENCES

Mathematical techniques for engineers & scientists Larry C Andrews, Ronald C Philips, Phi Publishers

Advanced engineering mathemartics M.C.Potter, J.L.Goldberg Oxford University Press

Higher engineering mathematics: B.S.Grewal, Khanna Publihsers

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

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

Module I

Transformers : working principles 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 efficiency, speed control, testing, load 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-principles of operation, over excited and under excited, starting, applications, synchronous capacitor.

Induction Motor: Induction motor, principles of operation, constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.

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 equipment 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)

References

- 1) Electrical Machines : By F.S.Bimbra, Khanna publications.
- 2) Advanced Electrical Technology : By H.Cotton, Wheeler publications.
- 3) Electrical Machines : Nagarath & Kothari, (TMH)

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

ME 303 MECHANICS OF SOLIDS

Module I

Tension, Compression, and Shear: Normal stress and strain, stress-strain diagrams, elasticity and plasticity, linear elasticity and Hooke's law, shear stress and strain, allowable stresses

Axially loaded members: Deflections of axially loaded members, statically indeterminate structures, temperature and pre-strain effects, strain energy

Analysis of stress and strain: Plane stress, plane strain, principal stresses and maximum shear stresses, Mohr's circle for plane stress, spherical & cylindrical pressure vessels

Module II

Torsion : Torsion of circular bars, pure shear, relation between modulus of elasticity and modulus of rigidity, power transmission, strain energy in torsion

Shear force and Bending moment: Types of beams, shear force and bending moment, relationship among load, shear force, and bending moment, shear force and bending moment diagrams

Module III

Stresses in beams: Normal strains in beams, normal stresses in beams, cross sectional shapes of beams, shear stresses in beams, beams with axial loads, Combined axial, bending, and torsional loads.

Theories of failure: Various theories of failure and their applications to ductile and brittle materials.

Module IV

Deflections of beams: Differential equations of the deflection curve, deflections by integration, Macaulay's method, moment area method, deflections of non prismatic beams, deflections of statically indeterminate beams- propped cantilevers and fixed beams
Columns: Buckling and stability, Euler's equations for columns with different support conditions,

TEXT BOOKS

Gere & Timoshenko: Mechanics of Materials, CBS Publishers

E.P.Popov : Introduction to mechanics of solids, Pearson Education.

References

1) Beer & Johnston: Mechanics of Solids, Mc Graw Hill

2) Shames & Pittaresi: Mechanics of Solids

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

ME 304 FLUID MECHANICS

Module – I

Introduction to Fluid flows - distinction between fluids and solids - viscosity and its effects – forces in fluids – surface tension and its effects – basic equations of fluid statics – pressure- variation of pressure in a static fluid- absolute and gauge pressure- measurement of gauge pressure- – pressure in the atmosphere – hydrostatic forces on plane and curved surfaces-centre of pressure – buoyancy and stability of submerged and floating bodies- metacentric height – Eulerian and Lagrangian methods – Classification of fluid flow – steady and unsteady flow – uniform and non-uniform flow – rotational and irrotational flows-one, two and three dimensional flows- stream lines – path lines – stream tube – stream surfaces – streak lines – Control volume – Reynolds Transport Equation

Module – II

Basic equation for one-dimensional flow through a stream tube and along a streamline – Euler's equation – Bernoulli's equation and its limitations-measurement of velocity-Pitot tube-Venturimeter - Orificemeter –Rotameter-Flow through orifice-Hydraulic coefficients-Experimental determination of hydraulic coefficients-Time of emptying a tank through an orifice at its bottom-Notches and weirs - fully developed flow through pipes-Reynold's experiment-laminar and turbulent flow- general equation for friction – laminar flow in circular pipes – Darcy Weisbach equation – friction factor – minor losses in pipes

Module – III

Introduction to two dimensional inviscid incompressible flows – equation of continuity in the differential form – velocity and acceleration-velocity potential function and stream function-vortex flow-uniform flow-source flow-sink flow- concept of stream function – rotational and irrotational of flow – velocity and acceleration in steady and unsteady flow - circulation and vorticity – stream function – velocity potential – one dimensional flow along a stream line – uniform flow – source and sink flow – free and forced vortex flow – Doublet flow – Vortex pair – Rankine half body – flow around cylinders – Magnus effect

Module – IV

Introduction to Boundary layers – development of boundary layer – boundary layer thickness – displacement thickness – momentum thickness – drag on a flat plate – boundary layer separation – control of separation – wakes-Navier Stokes equation – Blassius solutions for flow over a flat plate - turbulent flow – Karman vortex street – Vortex shedding – vortex sheet – vortex filament – flow visualization technique – Subsonic Wind Tunnel testing, Heleshaw experiment

TEXT BOOKS:

1. Introduction to Fluid Mechanics, Shaughnessy, Katz & Schaffer, OXFORD
2. Mechanics of Fluids: Bernard Massey, Eswar Press

REFERENCE BOOKS:

1. Fluid Mechanics, Mc. Donald, McGraw Hill
2. Fluid Mechanics, Frank M White, McGraw Hill
3. Engineering Fluid Mechanics, K. L Kumar, S Chand & Co.

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

ME 305 METALLURGY AND MATERIAL SCIENCE

Module I Crystallography : crystal structure, space lattice, crystal systems, miller indices of crystal planes and directions, atomic density of crystallographic planes and lines, atomic packing factor, coordination number, inter planar spacing.

Solidification of metals : homogenous and heterogeneous nucleation, crystal growth, grains and grain boundaries, equi-axed and columnar grains, dendritic pattern, polymorphism.

Crystal imperfections : point defect, line defect, edge dislocation, screw dislocation, interaction between dislocation, planar defects, stacking faults, grain boundary, twist and twin boundaries, volume defects.

Diffusion : mechanism of diffusion in crystals, types of diffusion, factors affecting diffusion, Fick's law of diffusion, metallurgical application of diffusion.

Module II Phase: Equilibrium between phases, Gibb's phase rule, solid solution, interstitial, substitutional, ordered and disordered types, Hume – Rothery rules, equilibrium phase diagrams of binary alloys complete solid solubility, partial solid solubility, no solid solubility, eutectic, peritectic and eutectoid reactions, Cu- Ni, Cd-Bi, Pb-Sn, Ag-Pt, and Fe-C systems as examples.

Heat treatment of steel: Definition and aims of heat treatment, T T T diagram, isothermal and continuous cooling, annealing, normalizing, hardening, tempering, austempering, martempering, hardenability of steels, jomini test, surface treatments –case hardening, carburising, cyaniding, nitriding, flame hardening, induction hardening, metal coating- hot dipping, electro plating, metal cladding, impregnation, metal spraying.

Module III Deformation of metals : Elastic, anelastic and visco elastic behaviour, plastic deformation, mechanism of slip, slip planes and slip directions, mechanism of twinning, strengthening mechanisms, work hardening, grain boundary hardening, precipitation hardening, cold working, hot working, recovery, recrystallisation and grain growth.

Failure of metals : creep, mechanism of creep, creep curves, creep resistant materials, fracture, brittle fracture, Griffith's theory, ductile fracture, ductile-brittle transition, protection against fracture, fatigue, mechanism of fatigue, S-N Curve.

Module IV Cast Irons : classification- grey, white, malleable, and spheroidal graphite cast irons, composition, properties and uses.

Steels : Classification of steels, function of alloying elements of steels, composition and properties of common commercially important alloy steels.

Non-ferrous alloys : composition, properties and use of common commercial alloys of Cu, Al, Mg, bearing metals.

References

- 1) L.W. Van Vlack : Elements of material science – Addison – Wesley.
- 2) Reed Hill : Physical metallurgy principles – Affiliated east-west press New Delhi
- 3) Clark & Varney : Physical metallurgy for engineers – Van Nostrand
- 4) V. Raghavan : Material science and engineering, Prentice Hall of India
- 5) Dieter : Mechanical metallurgy, McGraw Hill
- 6) Avner: Mechanical metallurgy, McGraw Hill
- 7) Narula : Material Science, Tata McGraw Hill
- 8) B.K.Agarwal : Introduction to engineering materials, Tata McGraw Hill
- 9) Manas Chanda : Science to Engg. Materials Vol I, II and III, Macmillan Co. of India.

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

ME 306 MACHINE DRAWING

Note: The examination will be of 4 hours duration

Module I

Screwed fastenings: Screw thread forms, V and Square threads, Conventional representation of threads, Hexagonal headed bolt and nut, Square headed bolt, Nut locking arrangements, Foundation bolts- ray bolt and Lewis foundation bolt.

Cotter and Pin joints: Socket and Spigot joints, Gib and Cotter joint for rectangular rods, Sleeve and Cotter joints, Knuckle joint.

Module II

Pipe joints : Coupler joints, Nipple joints, Union, Socket and Spigot joints, Integral flanged joints and Hydraulic joints.

Couplings: Parallel and Tapered sunk keys, Saddle keys, Feather keys and Pin keys, Muff coupling, Protected type flange coupling, Pin type flexible coupling.

Bearings : Solid journal bearings, Bushed bearings, Plummer block, Foot step bearing, Thrust bearings.

Module III

Assembly of machine parts: Machine Vice, Tail-Stock of Lathe

Steam Engine parts: Stuffing box, Cross head.

I.C. engine: Piston and Connecting rod.

Valves: Steam stop valve, Spring loaded safety valve, Lever safety valve, Ramsbottom safety valve.

Text Books:

1. N.D. Bhatt : Elementary engineering drawing (Charotar publishing house, Anand)
2. Parkinson : First year engineering drawing (Pitman, London)

References:

1. P.S. Gill : Machine drawing (Kataria & Sons, Ludhiana)
2. P.I. Varghese & K.C. John : Machine Drawing
3. K.R.Hert : Engineering drawing with problems and solutions (ELBS)

NOTE: Module I, two questions each of 30 marks, module II, two questions each of 30 marks, module III, two questions each of 40 marks with choice.

ME/MRE 307 STRENGTH OF MATERIALS LAB

Experiments

1. Shear test on M.S.Rod.
2. Vicker's pyramid hardness test.
3. Brinell Hardness test.
4. Tension test on M.S.Rod.
5. Impact test.
6. Spring test.
7. Bonding test on R.S.J. Beam.
8. Rockwell hardness test.
9. Compression test on concrete cubes and cylinders (300 T machine)
10. Preparation of cubes and cylinders.
11. Testing of cubes and cylinders.
12. Torsion test.

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.

ME 308: FLUID MECHANICS LABORATORY

1. Study of pipe fittings and plumbing tools
2. Experiment on notches
3. Pipe friction apparatus
4. Determination of minor losses
5. Metacentric height
6. Venturimeter
7. Orificemeter
8. Flow through orifice
9. Heleshaw experiment
10. Reynolds experiment
11. Free & forced vortex apparatus
12. Verification of Bernoullis equation

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.