

7) MECHANICAL SCIENCE

PART – A

- 1. Engineering Mathematics:** Linear Algebra: Matrices, System of Linear Equations, Eigen values and Eigen vectors; Calculus: Taylor's Series, Partial Derivatives, Total Derivatives, Definite Integrals; Differential Equations: Linear Ordinary Differential Equations, First Order Non Linear Ordinary Differential Equations, Initial and Boundary Value Problems, Laplace Transformation, Partial Differential Equations; Numerical Methods: System of Linear Equations, Jacobi, Gauss Siedel and Crout's methods, Runge Kutta and Newton - Raphson methods; Probability and Statistics: Gaussian and Weibul distribution and prop erties, Method of Least Squares, Regression Analysis, Analysis of Variance.
- 2. Engineering Materials:** Structure and properties of engineering materials, Heat treatment, composite materials and their applications.
- 3. Engineering Mechanics:** Free body concepts, Equations of Equilibrium, Centroids and Moment of inertia.
- 4. Strength Of Materials:** Stress and Strains, Elastic Constants, Principal Stresses, Maximum Shear Stress, Shear Force and Bending Moment diagrams, Stresses in Beams, Deflection of Beams, Torsion, Columns and Struts.
- 5. Fluid Mechanics:** Fluid properties, fluid statics, Manometry, Buoyancy, Conservation laws, Euler's equation, Bernoulli's equation, Viscous flow of incompressible fluids, Laminar and Turbulent flows, Flow through pipes, Dimensional analysis.
- 6. Thermodynamics:** Laws of thermodynamics, internal energy, enthalpy and entropy, Thermodynamic processes, Heat and work, Irreversibility and availability, perfect gas, properties of pure substances. Air standard and fuel air cycles. IC engines and Gas turbines, centrifugal and axial flow compressors, Basic concepts of Jet propulsion.
- 7. Theory Of Machines :** Analysis of planar mechanisms, Dynamic analysis of Slider-Crank mechanism. Cams and followers. Kinematics of Gears, Governors and flywheels, Balancing of reciprocating and rotating masses. Free and Forced vibrations of single degree freedom systems. Effect of damping, Transmissibility, Vibration Isolation, Critical speed of shafts.
- 8. Design Of Machine Elements:** Material and manufacturing considerations, Design of Shafts, keys, couplings, bolted, riveted and welded joints. Dynamic loads, Design of power screws, helical springs, Spur gears, clutches and brakes, Hydrodynamic lubrication, Journal bearings and anti friction bearings.
- 9. Production Engineering :** Metal casting processes, Melting and Pouring of cast iron, Ferrous and non-ferrous metals and alloys, casting defects, Inspection of castings. Hot and Cold working of metals. Metal joining processes. Soldering brazing and

welding, modern welding processes; Metal cutting tools - machine tool operations. Non-traditional machining processes.

10. Industrial Engineering And Management: Introduction to work study and method study. Principles of organization, types of organization types of ownership, functions of personnel management, functions of sales management. Materials management, inventory control, value analysis, scheduling & production control, PERT and CPM.

MODEL QUESTIONS
MECHANICAL SCIENCES
(AUTO/IPE/IEM/MNF/ME)

(Common to AUTO/IPE/IEM/MNF/ME)

SECTION-I OF PART -A

Each question carries One mark

- 1) Which one of the following theories is related to the theory of the thermocouple?
(a) Piezoelectric effect (b) Skin effect
(c) Seeback effect (d) Foraday's effect
- 2) The measurement of thermodynamic property known as temperature is based on:
(a) Zeroth law of thermodynamics (b) First law of thermodynamics
(c) Second law of thermodynamics (d) none of the above
- 3) Which of the following is self aligning bearing?
(a) Conical (b) Spherical (c) Rectangular (d) none of the above
- 4) The two bin system is concerned with
(a) Ordering procedure (b) Forecasting sales
(c) Production planning (d) none of the above
- 5) Production flow analysis (PF A) is a method of identifying part families that uses data from:
(a) Engineering drawings
(b) Production schedule and bill of materials
(c) Route sheets
(d) none of the above

