

MECHANICAL ENGINEERING (CODE NO. 11)

PAPER - I

Note : Use of Design Data Book is permitted.

1. Engineering Mechanics and Mechanics of Solids

Free body Diagram and Equilibrium; Trusses and Frames; Stress and Strains in Two Dimension; Mohr's Construction; Beams – Bending Moment and Shear Force Diagram; Bending and Shear Stress Distribution; Torsion of Shafts; Thin and Thick Walled Pressure Vessels; Euler's Theory of Column. Leaf and Helical springs.

2. Theory of Machines

Displacement, Velocity and Acceleration of Plane Mechanisms (Maximum 6 Links), Kliens' Construction; Law of Gearing, Gear Tooth Profile, Epicyclic Gear Trains; Motion Analysis of Cam and Followers; Balancing of Rotating Masses, Reciprocating Masses – Hammer Blow, Tractive Effort and Swaying Couple; Power Transmission by Belt Drive; Analysis of Simple Band, Block, Band and Block Brakes; Dynamometers; Free Vibrating of Single Degree of Freedom Systems; Whirling of Shafts; Gyroscopic Stability of Shaft, Ship and Aeroplane.

3. Design of Machine Elements

Design Concepts; Theories of Failure; Design for Static and Dynamic Loading, Design of Bolted, Rivetted and Welded Joints; Design of Shaft and Coupling.

4. Production Engineering

Merchant's Force Analysis, Tool Life and Tool Wear; Cutting fluids, Machinability and Machining Economics; Principles of Non-Traditional Machining Processes – EDM, ECM, USM & Laser; Principles of Design of Jigs and Fixtures; Limits, Fits and Tolerances; Comparators ,Gauge Design; Measurement of Surface Roughness; Interferometry; Acceptance Test of Machine Tools.

5. Production Management

Production Planning and Control; Forecasting Models; Aggregate Production Planning; Material Requirement Planning; Inventory Control – ABC Analysis, EOQ Model; Linear Programming – Simplex Method, Transportation & Assignment Model; Simple Queuing Models; PERT & CPM; Quality Control in Manufacturing, Control Charts for Variables & Attributes.

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PAPER - II

Note : Use of Steam Table and Psychometric Chart are permitted.

1. Thermodynamics

Steady Flow Energy Equation; Entropy and Irreversibility; Availability and Available Energy; Detailed Analysis of Thermodynamic Cycles and their Limitations.

2. Fluid Mechanics and Machines

Continuity, Momentum and Energy Equations; Flow net; Turbulent Flow through Pipes; Velocity Distribution in Laminar and Turbulent Flow; Dimensional Analysis; Boundary Layer on a Flat Plate; Adiabatic and Isentropic Flow of Compressible Fluids; Classification of Hydraulic Turbines and Pumps; Specific Speed; Impulse and Reaction Turbines; Velocity Diagrams.

3. Heat Transfer, Refrigeration and Air Conditioning

Critical Thickness of Insulation; Conduction through Walls and Pipes; Heat Transfer from Fins; Dimensionless Numbers; Free and Forced Convection; Heat Exchange by Radiation between black and Gray Surfaces; Electrical Analogy; Heat Exchanger Classification; Effectiveness; LMTD and NTU Methods; Fouling Factor.

Vapour Compression and Vapour Absorption Systems and their Cycle Analysis; Nomenclature, Properties and Characteristics of Important

Refrigerants; Ozone Friendly Refrigerants; Human Comfort and ASHRAE Comfort Charts; Estimation of Air-Conditioning Loads.

4. Energy Conversion Systems

Theories of Combustion in Compression Ignition and Spark Ignition Engines; Abnormal Combustion; Carburetion and Fuel Injection; Emissions from Engine and their Control; Modern Trends in IC Engines; Classification of Steam Turbines, Specific Speed, Velocity Triangles; Open and Closed Cycle Gas Turbine Plants; Nuclear Power Plants; Renewable Energy Sources.

5. Computer Aided Engineering

Introduction to CAD, 2D and 3D Drawing Concepts; Computer Aided Manufacturing – NC and CNC Machines, Methods of Part Programming; Elements of Robotics and Automated Material Handling System; FMS and Expert System.