

ANNEXURE-I

MECHANICAL ENGINEERING

Unit I: Workshop Technology and Conventions in Drawing

Basic Workshop tools and Operations in carpentry, fitting and sheet metal. Forging processes and tools - Cold and hot working processes. Pattern types – types of moulding sand and their properties - Defects in casting. Conventions in machine drawing – Production drawing – limits, fits & Tolerances – Surface finish – Specifications of standard components.

Unit II: Production Technology and Computer Aided Manufacturing Systems.

Equipment used in arc and gas welding. Modern welding methods – Submerged arc, atomic, hydrogen, CO₂, and Ultrasonic welding. Defects in welding.

Working and operations of Lathe, Drilling, Shaper, Slotter, Planner and Milling machines – Jigs, Fixtures and Jig Boring – Modern Machining processes – Ultrasonic machining, Electric Discharge Machining, Abrasive Jet Machining, Laser Beam machining and Chemical machining – Surface finishing operations – Honing, Lapping, Super finishing, Electro plating, Metal spraying.

Basic components of NC and CNC machines – CNC part programming - Manual and Computer assisted - Material handling in Computer Aided Manufacturing Systems – AGVs – Robots – Flexible Manufacturing Systems - Computer Integrated Manufacturing Systems and Rapid Prototyping.

Unit III: Engineering Materials and Solid Mechanics

Mechanical properties of materials – Destructive and Non-destructive testing of materials, Production of Iron and Steel – Iron Carbon equilibrium Diagram - Heat treatment processes – Plain Carbon and Alloy steels – Ferrous and Non-ferrous metals and alloys.

Resolution of Forces, Simple Machines, Simple stresses and strains – Shear force and bending moment diagrams – Strain energy – Deflection of beams – Torsion in shafts.

Unit IV: Theory of Machines and Design of Machine Elements

Belt and Chain drives – Velocity ratio, Belt tensions and centrifugal tension – Effect of belt thickness – Slip, lengths of open and cross belting – Power transmitted by belt, Simple, Compound, and epicyclic gear trains – Roller and Silent chains – Flywheels and Governors-Cams.

Design of – Bolted joints, Riveted joints and Welded joints - Shafts, Keys and Couplings– Bearings and Springs.

Unit V: Thermodynamics and Heat Power Engineering

Basic thermodynamics and Laws of Perfect gases, Thermodynamic processes, Air standard Cycles, fuels and combustion, I.C Engines - Two and Four stroke engines – Petrol and Diesel engines, Indicated and brake powers, Indicated and Brake thermal efficiencies, Air Compressors, Gas turbines and Jet propulsion.

Unit VI: Hydraulics and Fluid Power Systems

Basics of Fluid mechanics, Fluid Statics, Fluid Kinematics and Dynamics-Flow through pipes, Impact of Jets, Hydraulic turbines, Working principles and operation of reciprocating and centrifugal pumps, Hydraulic and pneumatic Circuit devices- Valves and Actuators.

Unit VII: Steam Boilers, Nozzles, Turbines and Condensers

Properties of Steam, Working, Performance of Boilers, Steam nozzles, Condition for maximum discharge – steam turbines – classification, Velocity diagrams for single stage impulse turbine and Reaction turbine- Steam Condensers.

Unit VIII: Refrigeration and Air Conditioning

Methods of refrigeration, Cycles and Analysis - Air, Vapor Compression and Vapor Absorption refrigeration, Refrigeration equipment – Air Conditioning and Psychrometry – Air Conditioning Equipment and Applications of Air Conditioning.

Unit IX: Industrial Management and Engineering

Work study, Inspection and SQC - Estimation and Costing – Basics of Industrial management, organization structures and behaviour, Production and materials management, Maintenance Management and Industrial Safety, Entrepreneurial development, Principles of ISO 9000.

Unit X: Energy Sources and Power Plant Engineering

Types of Renewable energy sources – Solar energy – Wind energy – Fuel cells – MHD generator – Bio energy – Tidal energy – Thermal power plants - layout, important elements in layout and supporting activities- Nuclear Power Plants – Nuclear Energy chain reaction, Nuclear fuels, Working Principle of Nuclear reactor such as PWR and BWR.

ANNEXURE II

Number of questions to be set (each question carries one mark)

MECHANICAL ENGINEERING

UNIT NO	TOPICS	MARKS
I	Workshop Technology and Conventions in drawing	12
II	Production Technology and Computer Aided Manufacturing Systems.	15
III	Engineering Materials and Solid Mechanics	12
IV	Theory of Machines and Design of Machine Elements	11
V	Thermodynamics and Heat Power Engineering	12
VI	Hydraulics and Fluid Power Systems	09
VII	Steam Boilers, Nozzles, Turbines and Condensers	10
VIII	Refrigeration and Air Conditioning	05
IX	Industrial Management and Engineering	08
X	Energy Sources and Power Plant Engineering	06
		100

ANNEXURE III

MODEL QUESTIONS FOR MECHANICAL ENGINEERING

1. Speed Control Valves are
 1. Flow Control Valves
 2. Pressure regulating Valves
 3. Non – Return Valves
 4. Direction Control Valves

2. A simply supported beam has a uniformly distributed load on it. The bending movement diagram is in the form of
 1. Rectangle
 2. Triangle
 3. Parabola
 4. Semicircle

3. The first law of Thermodynamics deals with conservation of
 1. Velocity
 2. Mass
 3. Momentum
 4. Energy