

## ANNEXURE I

### MECHANICAL ENGINEERING

#### Unit I: Workshop Technology

Basic Workshop tools and Operations (carpentry, fitting and sheet metal) Metrology – linear, angular and surface measurement – comparators.

Working and operations of lathe, Drilling, Shaper, slotter, Planner, milling machines – Capstan and turret lathes – copying lathes – surface finishing operations – Honing, lapping, super finishing, electro plating, metal spraying.

Basic components of NC, CNC, and DNC machines – FMS and robotics, CNC part programming- Manual and Computer assisted

#### Unit II: Welding, Forging, Foundry and Conventions in drawing

Equipment used in arc and gas welding. Modern welding methods – Submerged arc, atomic, hydrogen, CO<sub>2</sub>, and ultrasonic welding. Forging processes and tools - Cold and hot working processes. Pattern types – types of molding sand and their properties - Defects in casting and welding. Conventions in machine drawing – production drawing – limits, fits & Tolerances – surface finish – Specifications of standard components like Bolts, Nuts, Bearings etc.

#### 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 – Powder metallurgy .

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

#### Unit IV: Design of Machine Elements

Belt, rope 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 – Design of – Bolts, Nuts and Screws - Shafts, Keys, Couplings – Thin cylindrical Shells – Springs, cams, Flywheels and Governors

#### Unit V: Thermodynamics

Laws of Perfect gases and Basic thermodynamics, 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: Hydraulic Machines and Pneumatics

Properties of Fluids , Flow through pipes, Impact of Jets, Hydraulic turbines, Governing, Working principles and operation of reciprocating and centrifugal pumps, Hydraulic and pneumatic Circuit devices, air cylinders and Hydro Pneumatic Systems.

#### Unit VII: Steam Boilers, Nozzlers and Turbines

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.

#### Unit VIII: Refrigeration

Methods of refrigeration, Cycles and Analysis - Air, Vapor Compression and vapor absorption refrigeration, refrigeration equipment

#### Unit IX: Industrial Management and Engineering

Work study, Inspection and SQC, Estimation and Costing,- Principles and function of management, organization structures, Production and materials management, financial management, entrepreneurial development, Marketing and sales, Principles of ISO 9000.

#### Unit X: Automobile Engineering

Automobile Chassis construction, Function of transmission system, Gear boxes, single and multiplate clutches, Function and construction of propeller shaft, Universal Joint, Differential, semi and full floating rear axle, Front and Stub axles, wheel alignment and balancing, steering mechanisms. Braking system - weight transfer during braking, skidding, Hydraulic braking and air pressure braking systems.

**ANNEXURE II**  
**Number of questions to be set (each question carries one mark)**  
**MECHANICAL ENGINEERING**

UNIT NO	TOPICS	MARKS
I	Workshop Technology	13
II	Welding, Forging, Foundry and Conventions in Drawing	14
III	Engineering Materials and Solid Mechanics	12
IV	Design of Machine Elements	11
V	Thermodynamics	12
VI	Hydraulic Machines and Pneumatics	09
VII	Steam Boilers, Nozzles and Turbines	08
VIII	Refrigeration	04
IX	Industrial Management and Engineering	10
X	Automobile Engineering	07
		<b>100</b>

**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