

## Mechanical Engineering (Module II)

**Part II :** **Marks : 10**  
**Engineering Codes / Specifications (Mechanical)**

1. BIS Codes
2. ASME Codes
3. ASTM Codes

**Part III :** **Marks : 50**  
**Technical Knowledge (Mechanical Engineering)**

### General Mechanical Engineering Knowledge

#### **I. General**

- A. Engineering Principles
  1. Heat Transfer
  2. Mass Transfer
  3. Fluid Mechanics
  4. Materials Properties
- B. Fundamental Engineering Practice
  1. Relevant Engineering Technology
  2. Economics Analyses
  3. Project Management
  4. Industry and Company Design Standards
  5. Interpretation of Technical Drawings
  6. Electrical Principle

#### **II. Machine Design and Materials**

- A. Principles
  1. Strength of Materials
  2. Fatigue Theory
  3. Statics and Dynamics
- B. Applications
  1. Welding
  2. Pressure Vessels
  3. Vibration Analysis
  4. Material Selection
    - a. Corrosion
    - b. Economics

#### **III. Hydraulics and Fluids**

- A. Principles
  1. Compressible Flow
  2. Incompressible Flow
  3. Stress Analysis
- B. Applications
  1. Hydraulic Pumps
    - a. Pressure Loss
    - b. Efficiency

## **Mechanical Engineering (Module II) -- continued**

### **IV. Energy Conversion / Power Systems**

- A. Principles
  - 1. Thermodynamic Cycles
  - 2. Thermodynamic Properties
- B. Analysis of Systems and Components
  - 1. Energy Balances
  - 2. Pumps / Compressors

### **V. HVAC and Refrigeration**

- A. Principles
  - 1. Psychrometrics
  - 2. Thermodynamics
  - 3. Cooling / Heating Cycles

(A candidate has to select any one of the following five groups as per his area of specialization)

### **Group A : Air Conditioning and Refrigeration Module**

#### **I. Fundamentals**

- A. Psychrometrics
  - 1. Cooling / Heating Cycles
  - 2. Humidification / Dehumidification
- B. Principles
  - 1. Thermodynamics
  - 2. Fluid Mechanics
  - 3. Heat Transfer Principles
  - 4. Mass Transfer Principles
  - 5. Compression Processes
  - 6. Compressible Flow
  - 7. Thermodynamic Cycles
  - 8. Thermodynamic Properties
  - 9. Energy Balances

#### **II. Equipment and Materials**

- 1. Cooling Towers
- 2. Boilers and Furnaces
- 3. Condensers
- 4. Pumps / Compressors / Fans
- 5. Evaporators / Chillers
- 6. Cooling / Heating Coils
- 7. Control Systems Components
- 8. Refrigerants
- 9. Refrigeration Components

#### **III. Applications**

- A. Systems Applications
  - 1. Air Distribution Systems
  - 2. Water Distribution Systems
  - 3. Refrigeration Systems
  - 4. Air Quality Requirement
  - 5. Energy Recovery

## **Mechanical Engineering (Module II) -- continued**

### **B. Supportive Knowledge**

1. Vibration Control
2. Acoustics
3. Economic Analyses

### **Group B : Machine Design Depth Module**

#### **I. Engineering Principles**

1. Materials Properties and Selection
2. Strength of Materials
3. Fatigue Theory
4. Vibration Analysis
5. Statics and Dynamics
6. Stress Analysis
7. Kinematics

#### **II. Components**

1. Bearings
2. Gears
3. Springs
4. Shafts
5. Fasteners

### **Group C : Machine Design Application Module**

#### **Systems Applications**

1. Economic Analyses
2. Pressure vessels
3. Structural Analysis
4. Mechanism Analysis

### **Group D : Thermal Science and Fluid Systems Depth Module**

#### **Engineering Principles**

1. Materials Properties
2. Fluid Mechanics
3. Heat Transfer Principles
4. Mass Transfer Principles
5. Economic Analyses
6. Project Management
7. Compressible Flow
8. Incompressible Flow
9. Thermodynamics
  - a. Thermodynamic Cycles
  - b. Thermodynamic Properties
  - c. Energy Balances

### **Group E : Thermal and Fluid Components Application Module**

#### **I. Components**

- A. Hydraulic Systems Components
  1. Hydraulic Pumps
  2. Hydraulic and Pneumatic Lines, Fittings and Control Components

## **Mechanical Engineering (Module II) -- continued**

### **B. Power Plant Components**

1. Turbines
2. Pumps / Compressors
3. Heat Exchangers
4. Feed Water Heaters
5. Cooling Towers
6. Steam Generators
7. Condensers

### **II. Applications**

#### **Systems Applications**

1. Cooling / Heating cycles
2. Water Distribution Systems
3. Energy Recovery
4. Compressor Processes
5. Combustion Processes
6. Power Systems
7. Steam
8. Gas
9. Combined Cycles
10. Internal Combustion

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