

# CBCS SCHEME

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21EME15/25

## First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024 Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of steam table is permitted.

### Module-1

- 1 a. Explain the formation of super heated steam from water at  $0^{\circ}\text{C}$ , with relevant sketches and T-S diagram. (10 Marks)  
b. Compare renewable energy sources and non-renewable energy sources. (04 Marks)  
c. Find the enthalpy of 1kg of steam at 12 bar when,  
i) Steam is dry saturated  
ii) Steam at 22% wet  
iii) Superheated at  $250^{\circ}\text{C}$   
Assume the specific heat of the super heated steam as  $2.25\text{kJ/kg.k}$ . (06 Marks)

OR

- 2 a. Describe the process of converting nuclear energy into electrical energy with a neat sketch. (09 Marks)  
b. Explain with a neat sketch Pelton wheel turbine. (07 Marks)  
c. List the applications of steam in industries. (04 Marks)

### Module-2

- 3 a. What are composite materials and explain the main constituents of composite materials. (06 Marks)  
b. Discuss the process of oxy-acetylene gas welding with a neat sketch. Also sketch the different flames. (10 Marks)  
c. Write short notes on piezoelectric materials. (04 Marks)

OR

- 4 a. With a neat sketch explain Tungsten Inert Gas [TIG] welding process. (08 Marks)  
b. Differentiate between welding brazing and soldering. (06 Marks)  
c. Explain different modes of heat transfer, with examples. (06 Marks)

### Module-3

- 5 a. How chemical energy is converted into mechanical energy in four stroke petrol engine, explain with relevant sketches and P-V diagram. (10 Marks)  
b. Explain the important components of electric vehicles and list its advantages and disadvantages. (10 Marks)

OR

- 6 a. Define Ton of refrigeration. List the desirable properties of a refrigerant. (06 Marks)  
b. With a neat sketch explain how vapour absorption refrigeration system works. (10 Marks)  
c. Explain the principle of air conditioning. (04 Marks)

**Module-4**

- 7 a. List different configurations of a robot. Explain any two with appropriate diagrams. (09 Marks)
- b. Define machine and mechanism. (04 Marks)
- c. A simple gear train is made up of four gears, P, Q, R and S having 20, 40, 60 and 70 teeth respectively. if the gear P is the main driver rotating at 500rpm clockwise, calculate the following :
- Speed and direction of the last gear
  - Speeds of intermediate gear
  - Velocity ratio
  - Sketch the arrangement. (07 Marks)

**OR**

- 8 a. What is a gear drive? Explain with a neat sketches any three types of gear drive system. (10 Marks)
- b. With a necessary diagram, explain the components of a belt drive. (05 Marks)
- c. A turbine runs a generator at 1200rpm. The diameter of the turbine pulley and generator pulley are 1200mm and 400mm respectively. Find the velocity ratio and speed of the motor. (05 Marks)

**Module-5**

- 9 a. Explain the working principle of a lathe. List the applications of Milling and Drilling machine. (08 Marks)
- b. Explain how taper turning operation is performed by tailstock set-over method. (07 Marks)
- c. List and explain parts of a Milling machine. (05 Marks)

**OR**

- 10 a. Explain with a neat diagram, the components of CNC machine. (10 Marks)
- b. With a neat sketch explain open-loop and closed loop system. (05 Marks)
- c. Write short notes on smart manufacturing and industrial IOT. (05 Marks)

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