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18ME15/25

## First/Second Semester B.E. Degree Examination, Feb./Mar. 2022 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. Assume missing data, if any.  
 3. Use of steam table is permitted.

### Module-1

- 1 a. Explain in brief three primary processes of solar energy conversion into other forms of energy. (10 Marks)  
 b. Write a note on global warming and ozone depletion. (10 Marks)

**OR**

- 2 a. State and explain zeroth law, first law and second law of thermodynamics. (10 Marks)  
 b. Find the specific volume and enthalpy of 1 kg of steam at 0.8 MPa when:  
 (i) The steam is 10% wet.  
 (ii) The steam is heated to a temperature of 300°C.  
 Assume  $C_{Ps}$  value as 2.25 kJ/kg. (10 Marks)

### Module-2

- 3 a. What are the advantages and disadvantages of water tube boiler over fire tube boiler? (06 Marks)  
 b. List the boiler mountings such as mountings for safety and operations. (04 Marks)  
 c. With a neat sketch, explain the working of Pelton wheel. (10 Marks)

**OR**

- 4 a. Explain with neat sketch the working of centrifugal pump. (10 Marks)  
 b. Classify turbines. Explain the working of FRANCIS turbine. (10 Marks)

### Module-3

- 5 a. With the help of theoretical P-V diagram, explain OTTO four stroke cycle engine. (10 Marks)  
 b. The following observations were obtained during a trial on a 4-stroke diesel engine:  
 Cylinder dia = 250 mm  
 Stroke of the piston = 400 mm  
 Crankshaft speed = 250 rpm  
 Brake load = 687 N  
 Brake drum dia = 2m  
 Diesel oil consumption = 0.1 m<sup>3</sup>/min  
 Specific gravity of diesel = 0.78  
 Calorific value of diesel = 43900 kJ/kg  
 Find: (i) BP (ii) IP (iii) FP (iv)  $\eta_{mech}$  (v)  $\eta_{B.T}$  (10 Marks)

**OR**

- 6 a. Give the list of refrigerants with their applications. (05 Marks)  
 b. Define the following:  
 (i) Refrigerating effect (ii) Ton of refrigeration (iii) COP  
 (iv) Relative COP (v) Ice making capacity (05 Marks)  
 c. Explain with neat sketch the working principle of vapour absorption refrigeration. (10 Marks)



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**Module-4**

- 7 a. What is composite material? State advantages and applications of composite materials. (06 Marks)  
b. Write short notes on: (i) Shape memory materials (ii) Optical fibre glass (04 Marks)  
c. Derive an expression for the length of belt in crossed belt drive. (10 Marks)

**OR**

- 8 a. Classify metal joining processes. Explain different types of flames used in oxy-acetylene welding. (10 Marks)  
b. A simple gear train consists of four gears having 30, 40, 50, 60 teeth respectively. Determine the speed and direction of the last gear if the first gear makes 600 rpm in clockwise direction. (10 Marks)

**Module-5**

- 9 a. How do you specify a lathe? (04 Marks)  
b. Explain with a neat sketch taper turning by compound slide swiveling method. (10 Marks)  
c. Explain the following operations on milling machine with suitable sketches:  
(i) Plain milling (ii) Straddle milling (iii) Gang milling (06 Marks)

**OR**

- 10 a. Define robot. List the industrial applications of robot. (05 Marks)  
b. Explain the components of CNC with a block diagram. (10 Marks)  
c. Differentiate between open loop and closed loop systems. (05 Marks)

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