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18ME15/25

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 tables permitted.**

Module-1

- 1 a. What are renewable and non renewable energy sources? Give examples. (04 Marks)
- b. With temperature enthalpy diagram, explain the formation of steam at constant pressure. (08 Marks)
- c. State Zeroth law of thermodynamics. List similarities between work and heat. (08 Marks)

OR

- 2 a. What are the different states of steam? (04 Marks)
- b. Explain with a sketch working of a solar flat plate collector. (08 Marks)
- c. Find the enthalpy and specific volume of 1kg of steam at 10 bar when:
 - i) Steam is wet having dryness fraction 0.8.
 - ii) Steam is dry saturated.
 - iii) Steam is superheated to 300°C.

The specific heat of superheated steam is 2.25kJ/kg K. (08 Marks)

Module-2

- 3 a. Explain with a sketch working of Babcock and Wilcox boiler. (10 Marks)
- b. Explain with a sketch working of reciprocating pump. (10 Marks)

OR

- 4 a. Explain with a sketch working of Pelton wheel turbine. (10 Marks)
- b. Explain the functions of :
 - i) Water level indicator
 - ii) Pressure gauge
 - iii) Safety valve
 - iv) Economizer
 - v) Superheater. (10 Marks)

Module-3

- 5 a. Explain with a PV diagram working of 4 stroke diesel engine. (10 Marks)
- b. Explain with a sketch working of vapour absorption refrigerating system. (10 Marks)

OR

- 6 a. Define terms:
 - i) Refrigerant
 - ii) Refrigerating effect
 - iii) Ton of refrigeration
 - iv) COP
 - v) Relative COP. (05 Marks)

- b. How are IC engines classified? (05 Marks)
- c. A 2 stroke diesel engine has a piston diameter of 200mm and stroke of 300mm. The mean effective pressure is 2.8 bar and a speed of 400rpm. The diameter of brake drum is 1m and effective brake load is 64kg. Find the indicated power, brake power, mechanical efficiency and average piston speed. (10 Marks)

Module-4

- 7 a. How are composites classified? (04 Marks)
- b. Explain with a sketch process of arc welding. (08 Marks)
- c. Classify and explain various types of steel. (08 Marks)

OR

- 8 a. Briefly explain the following gear drives with a neat sketch: i) Spur gear ii) Helical gear (04 Marks)
- b. Derive an expression for length of belt in an open belt drive. (08 Marks)
- c. A shaft running at 150rpm is to drive a parallel shaft at 225rpm. Pulley on the driving shaft has a diameter of 35cms. Find the diameter of driven pulley, velocity ratio, linear velocity of the belt. (08 Marks)

Module-5

- 9 a. Explain with a sketch method of taper turning on lathe by swiveling of compound rest. (10 Marks)
- b. Define Robot. Explain with a sketch working of Cartesian co-ordinate robot. (10 Marks)

OR

- 10 a. Explain with sketch following operations on milling machine i) Plain milling ii) End milling iii) Slot milling iv) Form milling. (10 Marks)
- b. Discuss the elements of CNC system with neat block diagrams. (10 Marks)

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