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21EME15

First Semester B.E./B.Tech. 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. Use of Steam tables is permitted.

Module-1

- 1 a. Explain the role of Mechanical Engineering in Industries and Society. (06 Marks)
b. Explain formation of steam at constant pressure with T – h diagram. (06 Marks)
c. Calculate the specific volume and enthalpy of 5kg of steam at 1.2 MPa
i) When the steam is 12% wet ii) When the steam is superheated at 360°C. (08 Marks)

OR

- 2 a. Determine the density of 1 kg of steam initially at a pressure of 10 bar absolute, having a dryness fraction of 0.78. If 500 kg of heat is added at constant pressure, determine the condition and internal energy for the final state of steam. Given specific heat of superheated steam = 2.1kJ/kg. K. (10 Marks)
b. Explain with neat sketch, construction and working of a nuclear power plant. (10 Marks)

Module-2

- 3 a. Write short note on Smart material and shape memory alloys. (08 Marks)
b. Give comparison of welding , soldering and brazing. (08 Marks)
c. Give brief classification of Metals. (04 Marks)

OR

- 4 a. Explain briefly fibre reinforced and metal matrix composites. (08 Marks)
b. Give a brief introduction of TIG and MIG welding. (08 Marks)
c. Brief heat transfer in automobile radiators. (04 Marks)

Module-3

- 5 a. Explain the working of two stroke petrol engine with neat sketch. (08 Marks)
b. Define the following with respect to refrigeration and air conditioning :
i) COP ii) Ton of refrigeration iii) Refrigeration iv) Refrigeration effect. (08 Marks)
c. List out components of Electrical and Hybrid vehicles. (04 Marks)

OR

- 6 a. What is a Refrigerant? What are its characteristics? (08 Marks)
b. Briefly explain applications of IC engines in Power generation. (08 Marks)
c. Mention advantages and disadvantages of EVs and hybrid vehicles. (04 Marks)

Module-4

- 7 a. A simple gear train consists of 3 gears. The number of teeth on the driving gear is 60, on the roller gear is 40 and on the driven gear is 80. If the driving gear rotates at 1200 rpm, find speed of driven gear and also the velocity ratio. Sketch the arrangement of gear drive. (04 Marks)

- b. Explain different types of belt drives with their applications. (08 Marks)
c. Briefly explain Robot Anatomy with neat figure. (08 Marks)

OR

- 8 a. It is required to transmit a power of 20kW between 2 parallel shafts by means of belt drive arrangement. The speeds of driving and driven shafts are 150 rpm and 250 rpm respectively. Distance between parallel shafts is 2.7m. Driven pulley diameter is 60cm. Coefficient of friction between belt and pulley is 0.25. Determine the tensions and length of the belt for cross drive arrangement. (08 Marks)
b. Classify Robot configurations. Explain any two with neat sketch. (08 Marks)
c. Define Machines and Mechanisms. (04 Marks)

Module-5

- 9 a. Explain the construction and working of milling machine and applications. (08 Marks)
b. Explain Lathe Operations - Turning , Knurling , Boring , Taper turning. (08 Marks)
c. What are the components of CNC? (04 Marks)

OR

- 10 a. Explain Construction and working of lath. (08 Marks)
b. Explain the concepts of smart manufacturing and industrial IOT. (08 Marks)
c. Give a brief introduction of modern machining tools and techniques. (04 Marks)
