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18ME15/25

First/Second Semester B.E. Degree Examination, July/August 2022
Elements of Mechanical Engineering

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Explain renewable and non-renewable energy sources with suitable examples.   **(06 Marks)**
    b.   Sketch and explain the working principle of flat-plate collector.   **(10 Marks)**
    c.   What are the differences between fossil fuels and bio-fuels?   **(04 Marks)**

OR

2   a.   Define Zeroth law, First law and Second law of thermodynamics.   **(06 Marks)**
    b.   With a neat sketch, explain the process of formation of steam.   **(06 Marks)**
    c.   Find the enthalpy and specific volume of 1 kg of steam at 8 bar. The dryness fraction is 0.9, superheated steam temperature is 300°C and the specific heat of the steam is 2.25 kJ/kg°K. Assume T_S = 170.4 °C, V_S = 0.2403 m³/kg, V_f = 0.001115 m³/kg, h_f = 720.94 kJ/kg, h_{fg} = 2046.5 kJ/kg, h_g = 2767.5 kJ/kg.   **(08 Marks)**

Module-2

3   a.   With a neat sketch, explain the construction and working of Babcock and Wilcox boiler.   **(12 Marks)**
    b.   List the boiler mountings and accessories by mentioning their functions.   **(08 Marks)**

OR

4   a.   Sketch and explain the working principle of Pelton wheel turbine.   **(08 Marks)**
    b.   Explain the working principle of centrifugal pump.   **(08 Marks)**
    c.   What is cavitation? Briefly explain.   **(04 Marks)**

Module-3

5   a.   Give the broad classification of I.C. engines and with a neat sketch, explain the various parts of an I.C. engine.   **(12 Marks)**
    b.   4-stroke diesel engine has a Piston diameter of 250 mm, stroke length of 400 mm, mean effective pressure is 4 bar, dia of brake drum is 1m and speed is 500 rpm. Calculate the IP, BP and FP by assuming an effective brake load of 400 N.   **(08 Marks)**

OR

6   a.   List the important properties of a good refrigerant.   **(04 Marks)**
    b.   Sketch and explain the working principle of vapour compression refrigeration system.   **(10 Marks)**
    c.   Explain the working principle of air-conditioner.   **(06 Marks)**

Module-4

7   a.   Classify ferrous and non-ferrous materials and list the application of it.   **(05 Marks)**
    b.   What is a composite material and classify the various composite materials?   **(05 Marks)**
    c.   Explain TIG and MIG welding.   **(10 Marks)**

OR

8	a.	Derive the expression for a length of a belt for a open belt drive.	**(10 Marks)**
	b.	List the advantages of gear drives over belt drives.	**(04 Marks)**
	c.	A gear wheel of 20 teeth drives another gear having 36 teeth running at 200 rpm. Calculate the speed of driving wheel and velocity ratio.	**(06 Marks)**

Module-5

9	a.	Explain any three lathe operations with simple sketch.	**(06 Marks)**
	b.	Sketch and explain taper turning by Tailstock offset method.	**(06 Marks)**
	c.	Explain the construction and working of vertical milling machine.	**(08 Marks)**

OR

10	a.	Sketch and explain the components of a CNC machine.	**(08 Marks)**
	b.	List the advantages of CNC machines over conventional machines.	**(04 Marks)**
	c.	List and explain any one type of robot configuration system.	**(08 Marks)**

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