USN | | | | | | | | | | **21EME15/25**

First/Second Semester B.E. Degree Examination, June/July 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. Discuss the emerging trends and technologies in Energy, Manufacturing, Aerospace, Automotive and Marine Sectors and their contribution to the GDP. **(10 Marks)**

 b. Define the following terms:
   i) Sensible heat   ii) Latent heat of evaporation   iii) Amount of superheat
   iv) Degree of superheat   v) Dryness fraction **(10 Marks)**

OR

2 a. Find the enthalpy of 1 kg of steam at 12 bar, when :
   i) Steam is dry saturated   ii) Steam is 22% wet   iii) Superheated to 250°C
   Assume specific heat of superheated steam as 2.25 kJ/kg °K (From steam tables, at 12 bar, $t_s = 188°C$, $h_f = 798.43$ kJ/kg , $h_{fg} = 1984.3$ kJ/kg) **(10 Marks)**

 b. With a neat sketch explain the construction and working of a Nuclear Power Plant. **(10 Marks)**

Module-2

3 a. What is Kaplan turbine? With a neat sketch explain the construction and working of a Kaplan turbine. **(10 Marks)**

 b. How are composites classified? Explain each one of them briefly. **(10 Marks)**

OR

4 a. Write short notes on :
   i) Shape memory alloys   ii) Piezoelectric materials **(10 Marks)**

 b. With the help of a neat sketch explain the principle and process of electric arc welding. **(10 Marks)**

Module-3

5 a. Draw a schematic diagram of an IC engine and mention the functions of various parts. **(10 Marks)**

 b. Write short notes on :
   i) Electric vehicles   ii) Hybrid vehicles **(10 Marks)**

OR

6 a. Differentiate between refrigeration and air conditioning. Briefly discuss the desirable properties of a good refrigerant. **(10 Marks)**

 b. With a neat sketch explain the construction and working of a vapour compression refrigeration system. **(10 Marks)**

Module-4

7   a.   Differentiate between the following :
        i) Spur gear and Bevel gear   (10 Marks)
        ii) Helical gear and Herringbone gear   (05 Marks)
    b.   Derive velocity ratio for a compound gear train.
    c.   A simple gear train consists of four gear wheels having 30, 40, 50 and 60 teeth respectively.
         Determine the speed and direction of the last gear, if the first gear makes 600 rpm in   (05 Marks)
         clockwise direction.

OR

8   a.   How are robots classified based on their physical configuration? Explain any two of them
         with neat functional sketches.   (10 Marks)
    b.   The sum of diameters of two pulleys is 1000 mm and the pulleys are connected by a belt.
         If the pulleys rotate at 600 rpm and 1800 rpm, determine the diameter of each pulley.
                                                                              (05 Marks)
    c.   Differentiate between linear and oscillatory motion. Give one example for each.   (05 Marks)

Module-5

9   a.   Discuss the following Lathe operations with neat sketches:
        i) Facing   (10 Marks)
        ii) Knurling
    b.   Briefly explain open loop and closed loop control systems with simple block diagrams.
                                                                              (10 Marks)

OR

10 a.   With a neat sketch explain the construction and working of a vertical milling machine.
                                                                              (10 Marks)
    b.   Write short notes on :
        i) CNC machining center
        ii) CNC turning center.   (10 Marks)

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