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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First / Second Semester, B.E. - Semester End Examination; Sep. / Oct. - 2023

Elements of Mechanical Engineering

(Common to all Branches)

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1 - Identify the basic concept and fundamentals of mechanical engineering and understanding of technical and operational features.

CO2 - Describe the working principle of energy sources, energy conversion and power transmission systems in terms of societal and environmental aspects.

CO3 - Understand and Explain the conventional and non-conventional methods of manufacturing process.

CO4 - Identify various automation of manufacturing process encountered in engineering practice.

Note: I) PART - A is compulsory. **Two** marks for each question.

II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.

| Q. No. | Questions | Marks | BLs | COs | POs |
|----------------------|--|-----------|------|-----|-----|
| I : PART - A | | 10 | | | |
| 1 a. | Explain the importance of non-conventional energy sources in the present context. | 2 | L1 | CO1 | PO1 |
| b. | How hybrid vehicles are different from Electric vehicles (EVs)? | 2 | L1 | CO2 | PO1 |
| c. | List out the properties of good refrigerants. | 2 | L1 | CO3 | PO1 |
| d. | Differentiate between hot working and cold working. | 2 | L1 | CO4 | PO1 |
| e. | What are the various types of sensors used in robots? | 2 | L1 | CO4 | PO1 |
| II : PART - B | | 90 | | | |
| UNIT - I | | 18 | | | |
| 2 a. | What are the main advantages of solar flat plate collector? With the help of neat schematic diagram, explain the working of solar flat plate collector. | 9 | L1,2 | CO1 | PO2 |
| b. | Discusses the generation of steam at constant pressure. Show various process on temperature volume and temperature heat input diagrams. | 9 | L2 | CO1 | PO2 |
| c. | A Spherical vessel of 0.5 m diameter contains a mixture of saturated water and saturated steam at 300°C. The saturated water occupies $\frac{1}{4}$ th of its volume and the remaining saturated steam. Calculate their masses and the dryness fraction of the mixture. Also, find the enthalpy of the mixture. How much of the heat is to be added to convert the mixture into dry saturated steam at the same pressure. | 9 | L3 | CO1 | PO2 |
| UNIT - II | | 18 | | | |
| 3 a. | With the help of a neat sketch, explain the working of a Parson's turbine. | 9 | L2 | CO2 | PO1 |

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| <p>b. The following observations were obtained during a trial on a 4-stroke Diesel engine: Cylinder diameter = 25 cm, stroke of the piston = 40 cm, Crankshaft speed = 250 RPM, Brake load = 70 kg, Brake drum diameter = 2 m, mean effective pressure = 6 bar, diesel oil consumption = 0.1 kg/min, Specific gravity of diesel = 0.78, Calorific Value of the diesel = 43900 kJ/kg. Find; i) BP, ii) IP, iii) FP, iv) Mechanical efficiency, v) Indicated thermal efficiency vi) Brake thermal efficiency.</p> <p>c. Write short notes on;</p> <p style="padding-left: 20px;">i) Automotive transmission system</p> <p style="padding-left: 20px;">ii) Suspension system</p> <p style="padding-left: 20px;">iii) E-Vehicles</p> | <p>9</p> <p>9</p> | <p>L3</p> <p>L2</p> | <p>CO2</p> <p>CO2</p> | <p>PO2</p> <p>PO1,2</p> |
| UNIT - III | | | | |
| 18 | | | | |
| <p>4 a. What is the difference between refrigeration and air conditioning? Draw a neat sketch of a room air conditioner and explain its working principle.</p> <p>b. Explain the following terms:</p> <p style="padding-left: 20px;">i) Slip ii) Creep iii) Velocity Ratio</p> <p>c. Write down the classification of gears. Explain simple and compound gear trains.</p> | <p>9</p> <p>9</p> <p>9</p> | <p>L1,2</p> <p>L1,2</p> <p>L2</p> | <p>CO2</p> <p>CO1</p> <p>CO2</p> | <p>PO1</p> <p>PO1</p> <p>PO1</p> |
| UNIT - IV | | | | |
| 18 | | | | |
| <p>5 a. With a neat schematic diagram, explain the working principle of arc welding process.</p> <p>b. What are patterns and moulds? Explain the steps involved in casting process.</p> <p>c. Sketch and explain the following machine tool operations:</p> <p style="padding-left: 20px;">i) Taper turning by swivelling compound rest</p> <p style="padding-left: 20px;">ii) Knurling Process</p> <p style="padding-left: 20px;">iii) Tapping</p> | <p>9</p> <p>9</p> <p>9</p> | <p>L2</p> <p>L1,2</p> <p>L2</p> | <p>CO3</p> <p>CO3</p> <p>CO3</p> | <p>PO1,2</p> <p>PO1,2</p> <p>PO1,2</p> |
| UNIT - V | | | | |
| 18 | | | | |
| <p>6 a. Briefly explain the working principle of water jet machining. List the advantages of Additive manufacturing.</p> <p>b. Define robotics. Explain cylindrical and spherical robot configurations with neat sketch.</p> <p>c. Mention different types of automation. Explain the basic elements of Computer Numerical Control machines.</p> | <p>9</p> <p>9</p> <p>9</p> | <p>L1,2</p> <p>L2</p> <p>L2</p> | <p>CO3</p> <p>CO4</p> <p>CO4</p> | <p>PO1,2</p> <p>PO1,2</p> <p>PO1,2</p> |