

Code No: R15A0303

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R15

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Engineering Thermodynamics

(ME)

Roll No										

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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**PART-A (25 Marks)**

- 1). a Write down the Steady flow energy equation. [2M]
- b Describe Zeroth law of thermodynamics. [3M]
- c What is heat pump? [2M]
- d Explain PMM-2 with neat sketch. [3M]
- e Define pure substances. Mention the examples. [2M]
- f Find the enthalpy of the steam at 20 bar pressure with dryness fraction of 0.8. [3M]
- g State the Avogadro's law. [2M]
- h Explain about Psychrometric chart. [3M]
- i What is refrigerant. Name the different types of refrigerants. [2M]
- j Draw the P-V and T-S diagram for Diesel engine. [3M]

**PART-B (50 MARKS)**

**SECTION-I**

- 2 Explain the following terms [10M]
  - i) Point and path function with suitable examples
  - ii) Similarities and dissimilarities between heat and work

OR

- 3 Show that internal energy is a property. [10M]

**SECTION-II**

- 4 Explain the Carnot cycle and derive thermal efficiency of Carnot cycle with help of P-V and T-S diagrams. [10M]

OR

- 5 Briefly explain about heat engine and heat pump with suitable sketches. [10M]

**SECTION-III**

- 6 Describe the steam formation process from ice to superheated with help of T-S and h-S diagrams. [10M]

OR

- 7 Derive and explain Vander Walls equation of state. [10M]

**SECTION-IV**

- 8 The pressure and temperature of the air in a room are 100 kPa and 300C. If the [10M]

relative humidity is 30%, find the partial pressure of the water vapour and the dew point, specific volume of the air and water vapour and specific humidity.

OR

- 9 State and explain the following terms; [10M]
- i) Dalton's law of partial pressure
  - ii) Mass fraction
  - iii) Specific heat and latent heat
  - iv) Atmospheric air

**SECTION-V**

- 10 Derive the expressions for the thermal efficiency and mean effective pressure of an Otto cycle. [10M]

OR

- 11 With neat sketch explain the Bell Coleman cycle. [10M]

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Code No: R15A0305

R15

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Strength of Materials

(ME)

Roll No									
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Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

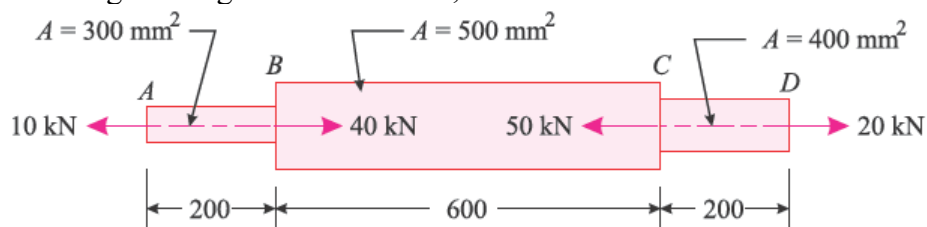
PART-A (25 Marks)

- 1). a Define factor of safety. [2M]
- b What is a composite bar? Explain. [3M]
- c Define shear force and bending moment. [2M]
- d What are the different types of beams? Differentiate between a cantilever and a simply supported beam. [3M]
- e Write section modulus formula for rectangular section. [2M]
- f Find the ratio of maximum shear stress to average shear stress in the case of a circular section. [3M]
- g What is an imperfect frame? [2M]
- h Find the slope for a cantilever beam of span L, Loaded with a UDL of W kN/m for the whole span. [3M]
- i A solid circular shaft of 100 mm diameter is transmitting 12 kW at 150 rpm. Find the torque transmitted. [2M]
- j Deduce the circumferential stress equation for a thin cylindrical shell subjected to an internal pressure of intensity 'P' with a thickness 't' and diameter 'd'. [3M]

PART-B (50 MARKS)

SECTION-I

- 2 A member ABCD is subjected to point load as shown in Figure. Determine the total change in length of the member, Take  $E = 200 \text{ GPa}$ . [10M]

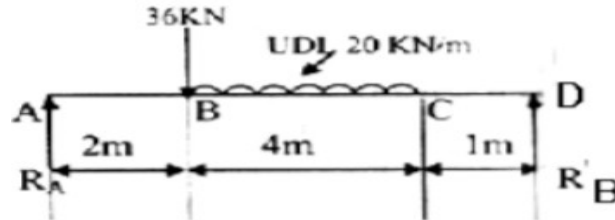


OR

- 3 A load of 120 N falls through a height of 20 mm on a collar rigidly attached to the lower end of a vertical bar 1.2 m long and of 1.5 cm<sup>2</sup> cross-sectional area. The upper end of the vertical bar is fixed. Determine: (i) maximum instantaneous stress induced in the bar, and (ii) Maximum instantaneous elongation. Take  $E = 2 \times 10^5$  N/mm<sup>2</sup>. [10M]

**SECTION-II**

- 4 A Beam ABCD is loaded as shown in figure. Draw shear force and bending moment diagram. [10M]



OR

- 5 A simply supported beam of span 10 m carries point loads 6 kN each at distance of 3 m and 5 m from left support and also a uniformly distributed load of 2 kN/m between the two point loads. Draw the SF and BM diagram for the beam. [10M]

**SECTION-III**

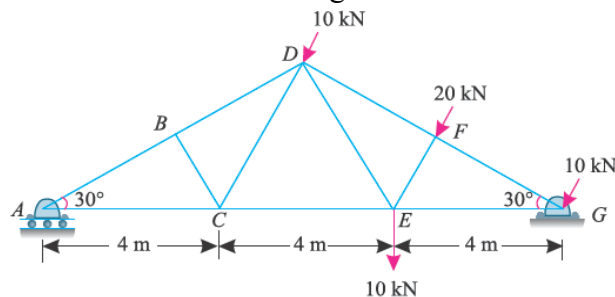
- 6 a) Calculate Section modulus of circular section. [3M]  
b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 4 metres. If the beam is subjected to a uniformly distributed load of 4.5 kN/m, find the maximum bending stress induced in the beam. [7M]

OR

- 7 a) Find the section modulus for a section, if breadth is equal to half of its depth. [3M]  
b) A beam of triangular cross-section having base width of 100 mm and height of 150 mm is subjected to a shear force of 13.5 kN. Find the value of maximum shear stress and sketch the shear stress distribution along the depth of beam. [7M]

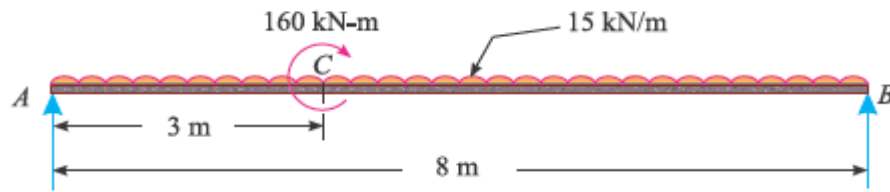
**SECTION-IV**

- 8 A truss of 12 m span is loaded as shown in Figure. Determine the forces in the members BD, CE and CD of the truss using method of sections. [10M]



OR

- 9 A horizontal beam AB is freely supported at A and B 8 m apart and carries a uniformly distributed load of 15 kN/m. A clockwise moment of 160 kN-m is applied to the beam at a point C, 3 m from the left hand support A. Calculate the slope of the beam at C. Use Macaulay's method. Take  $EI = 40 \times 10^3$  kN-m<sup>2</sup>. [10M]



**SECTION-V**

- 10 a) Define Torsional stiffness. **[2M]**  
 b) A solid shaft of 120 mm diameter is required to transmit 200 kW at 100 rpm. If the angle of twist not to exceed  $2^\circ$ , find the length of the shaft. Take modulus of rigidity for the shaft material as 90 GPa. **[8M]**
- OR
- 11 a) Define circumferential stress. **[2M]**  
 b) A cylindrical shell 2 m long and 1 m internal diameter is made up of 20 mm thick plates. Find the circumferential and longitudinal stresses in the shell material, if it is subjected to an internal pressure of 5 MPa. **[8M]**

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