

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks. Use of steam table is permitted. Max. Marks: 50

(4 × 2.5 = 10)

1. Attempt any four parts of the following:
- Find the specific volume, enthalpy, internal energy and entropy of wet steam at 15 bar pressure and dryness fraction 0.8.
  - What do understand by boiler mountings and accessories? Also explain it in brief.
  - What do understand by Internal Combustion Engine? Explain Otto and Diesel Cycle with the help of P-V and T-s diagram.
  - Explain the working of Cochran boiler with the help of neat sketch.
  - Explain the working of Sine bar with the help of neat sketch.
  - What do understand by steel alloy? Also explain different types of steel alloy in brief.

Attempt any two parts of the following:

(2 × 5 = 10)

- Explain the terms: Yield point, Strain hardening and Ultimate strength. Draw the stress-strain diagram for mild steel and explain the salient features.
- A bar of steel is 60 mm x 60 mm in section and 180 mm long. It is subjected to a tensile load of 300 kN along the longitudinal axis and tensile loads of 750 kN and 600 kN on the lateral faces. If Young's modulus of steel is 200 GN/m<sup>2</sup> and poisson's ratio is 0.3. Find the change in volume, modulus of rigidity and bulk modulus.
- Explain the term Resilience. Also Derive the expression for strain energy stored in a body when the load is applied gradually.

Attempt any two parts of the following:

(2 × 5 = 10)

- What do you mean by Hardness? Also Explain different types of hardness test.
- A member ABC is formed by connecting a steel bar of 20 mm diameter to an aluminium bar of 30 mm diameter, and is subjected to forces as shown in Fig. 1. Determine the total deformation of the bar, taking E for aluminium as  $0.7 \times 10^5$  N/mm<sup>2</sup> and that for steel as  $2 \times 10^5$  N/mm<sup>2</sup>. Also find the stress in aluminium bar.

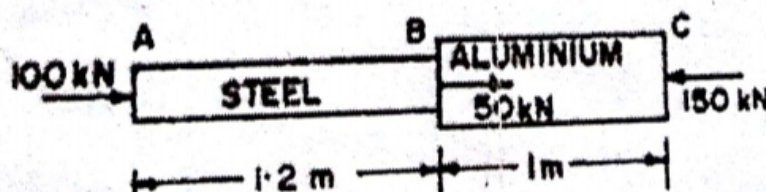


Figure. 1



- Attempt any two parts of the following: (2 × 5 = 10)
- (a) Define the different types of loads which applied on beam. Also Explain different types of beam with the help of neat sketch.
- (b) Draw the shear-force and bending-moment diagrams for the simply supported beam as shown in figure.2.

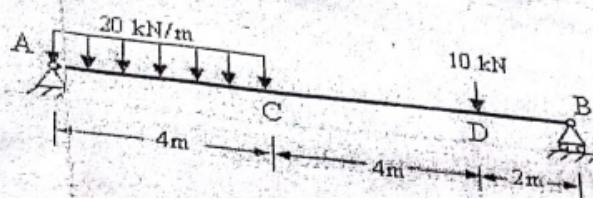


Figure.2

- (c) Draw the shear-force and bending-moment diagrams for the cantilever beam as shown in the figure.3.

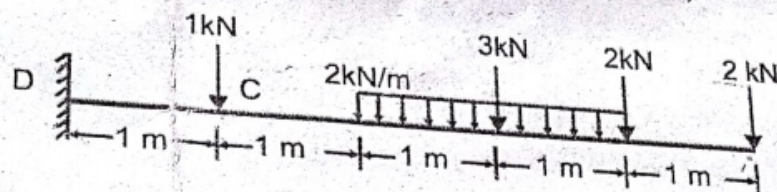


Figure.3

- Attempt any two parts of the following: (2 × 5 = 10)
- (a) What do you mean by Pure Bending? Also Derive the Bending equation for beam with assumptions.
- (b) Explain the term polar modulus. A solid circular shaft transmits 75 kW power at 200 rpm. Calculate the shaft diameter, if the twist is not to exceed  $1^\circ$  in 2 metres in length of shaft, and shear stress is limited to  $50 \text{ MN/m}^2$ . Take modulus of rigidity =  $100 \text{ GN/m}^2$ .
- (c) Three beams have the same length, the same allowable stress and the same bending moment. The cross-sections of the beams are a square, a rectangle with depth twice the width and a circle. Determine the ratios of weights of the circular and the rectangular beams with respect to the square beam.