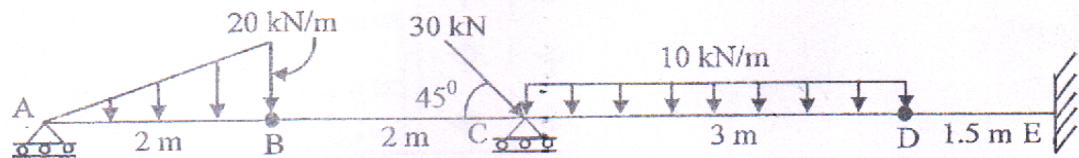


N.B.: (1) Question No. 1 is compulsory. Answer any four from remaining six questions.

(2) Illustrate your answers with neat sketches whenever necessary

(3) Assume any other data needed suitably, if not given. However, justify the same.

1. (a) State the disadvantages of welding. 5
- (b) Derive the relationship between shear force, bending moment and intensity of loading. 5
- (c) Derive an expression for longitudinal stress in thin cylinder. 5
- (d) State the assumption made in the theory of simple bending 5
2. (a) A railway is laid so that there is no stress in the rails at  $8^{\circ}\text{C}$ . Calculate (a) the stress on the rail at  $50^{\circ}\text{C}$  if there is no allowance for expansion, (b) the stress in the rail at  $50^{\circ}\text{C}$  if there is an expansion allowance of 8 mm per rail, (c) the expansion allowance if the stress in the rail is to be zero when the temperature is  $50^{\circ}\text{C}$ , (d) the maximum temperature to have no stresses in the rails if the expansion allowance is 12 mm per rail. The rails are 30 m long. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $\alpha = 12 \times 10^{-6} \text{ per } ^{\circ}\text{C}$ . 10
- (b) Draw the axial force, shear force and bending moment diagrams for the beam loaded as shown below. Internal hinges at B and D. 10



3. (a) Compare the flexural strength of the following three beams of equal weight. 10
  - (i) I section 100 mm  $\times$  200 mm having 10 mm flange thickness and 8 mm web thickness.
  - (ii) A rectangular section having depth equal to twice the width.
  - (iii) Solid circular section
- (b) What are the principal planes and principal stresses? Explain the Mohr's Circle method for two perpendicular direct stresses with state of simple shear. 6
- (c) A simply supported wooden beam 200 mm wide and 400 mm deep supports a central point load of 160 kN over a span 4 m. Determine average shear stress and maximum shear stress. 4
4. (a) A steel beam of I-section has top flange 300 mm wide and 50 mm thick, bottom flange 200 mm wide and 50 mm thick, web is 50 mm wide. Overall depth of the section is 400 mm. It is subjected to shear force of 1600 kN. Draw the shear stress distribution over the depth of the section, indicating the principal values. 15
- (b) Explain the concept of beam of uniform strength. 5

[Turn Over