

**STRENGTH OF MATERIALS – I**  
(Civil Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- Write the classification of loads.
  - Write the classification of stresses.
  - Write the classification of beams.
  - Define shear force and bending moment.
  - Write the assumptions in the theory of simple bending.
  - A circular beam of 100 mm diameter is subjected to a shear force of 30 kN. Calculate the value of average shear stress across the section.
  - Explain beam deflection.
  - Write the uses of Macaulay's method for determining the deflection of a beam.
  - Write the advantages of conjugate beam method over other methods.
  - Explain the condition for no tension in the section in terms of eccentricity.

**PART – B**  
(Answer all five units, 5 X 10 = 50 Marks)**UNIT – I**

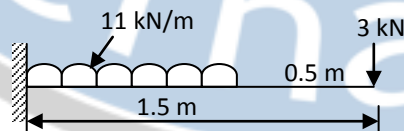
- 2 The following observations were made during a tensile test on a mild steel specimen 40 mm in diameter and 200 mm long. Elongation with 40 kN load,  $\delta l = 0.0304$  mm, yeild load = 161 kN, maximum load = 242 kN and length of specimen at fracture = 249 mm. Determine: (i) Young's modulus of elasticity. (ii) Yield point stress. (iii) ultimate stress. (iv) Percentage elongation.

OR

- 3 Derive the relation between E, C and K.  
(Where E = Youngs modulus, C = Rigidity modulus and K = Bulk modulus).

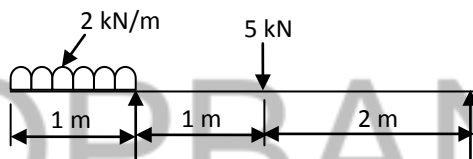
**UNIT – II**

- 4 Draw the shear force and bending moment diagrams for the cantilever loaded as shown in figure below.



OR

- 5 Draw the shear force and bending moment diagram for the overhanging loaded as shown in figure below. And also locate the point of contra-flexure.



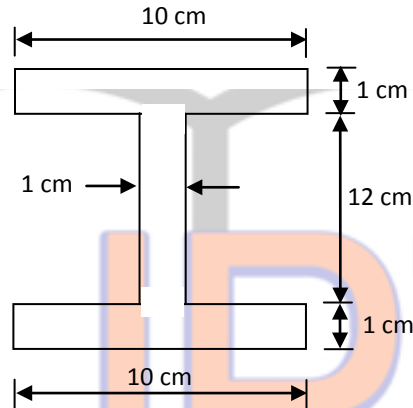
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## UNIT – III

- 6 A simply supported beam of span 5 m has a cross-section 150 mm × 250 mm of the permissible stress is  $10 \text{ N/mm}^2$ . Find: (i) Maximum intensity of uniformly distributed load it can carry. (ii) Maximum concentrated P applied at 2 m from one end it can carry.

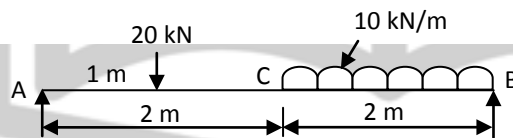
OR

- 7 Calculate the maximum tensile and shear stresses induced in the I - section with rectangular ends shown in figure below is subjected to a bending moment of 5 kNm and a shearing force of 5 kN.



## UNIT – IV

- 8 A beam AB of 4 m span is simply supported at the ends and is loaded as shown in figure below. Determine: (i) Deflection at C. (ii) Maximum deflection. (iii) Slope at the end A. Take  $E = 200 \times 10^6 \text{ kN/m}^2$  and  $I = 20 \times 10^{-6} \text{ m}^4$ .

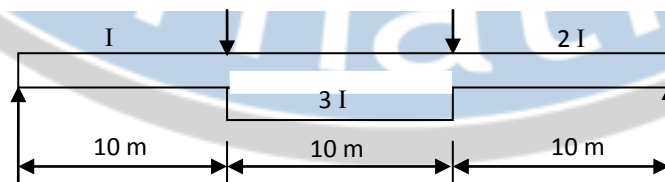


OR

- 9 A cantiliver beam of 4 m span carries a U.D.L of 3 kN/m over its entire span and a point load of 3 kN at free end. If the same beam is simply supported at two ends, what point load at the centre should it carry to have same deflection as the cantiliver.

## UNIT – V

- 10 Find the slopes and deflections at A, B, C and D for the beam shown in figure below, using conjugate beam method. Take  $E = 200 \times 10^6 \text{ kN/m}^2$  and  $I = 300 \times 10^{-4} \text{ m}^4$ . Neglect the weight of the beam.



OR

- 11 A rectangular strut is 20 cm wide and 15 cm thick. It carries a load of 60 kN at an eccentricity of 2 cm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section.

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