B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

STRENGTH OF MATERIALS - I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

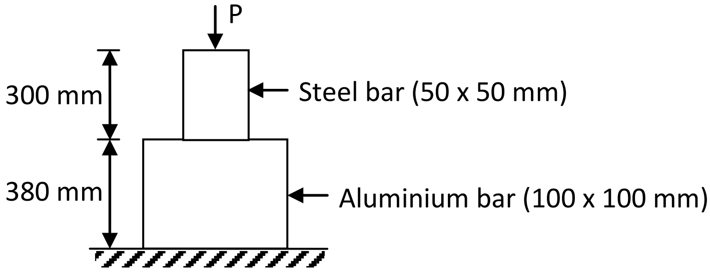
Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define the following:
(i) Elasticity (ii) Plasticity (iii) Hooke's law (iv) Poisson's ratio.

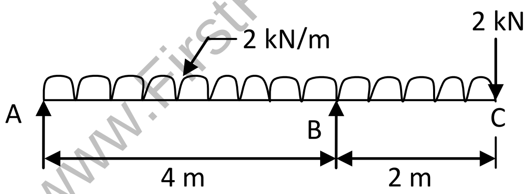
(b) A member formed by connecting a steel bar to an aluminium bar as shown in figure below. Assuming the bars are prevented from buckling sideways, calculate the magnitude of force "P" that will cause the total length of member to decrease 0.25 mm. The values of elastic modulus of steel & aluminium are $2.1 \times 10^5\ N/mm^2$ and $7 \times 10^4\ N/mm^2$ respectively.



(c) A steel bar of 300 mm long, 50 mm wide & 40 mm thick is subjected to pull of 300 kN in direction of its length. Determine the change in volume. Take E = $2\text{x}10^5$ N/mm^2, $\mu = 0.25$.

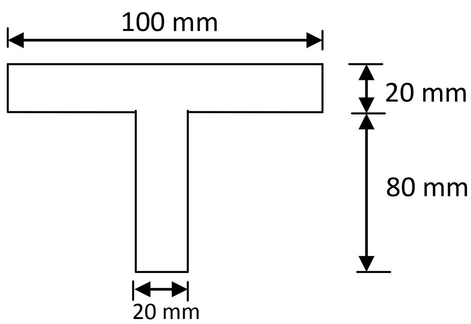
2 (a) Define the following:
(i) Shear force (ii) Bending moment (iii) Point of contraflexure (iv) Shear force diagram.
(v) Bending moment diagram.

(b) Draw the shear force & bending moment diagram for overhanging beam & also locate the point of contraflexure for the given below.



3 (a) Mention the assumptions made by the theory of simple bending.

(b) A cost iron beam is of T section as shown in figure below. The beam is simply supported on span of 8 m. The beam carries a UDL of 1.5 kN/m for the entire span. Determine the maximum tensile & compression stresses.



Contd. in page 2

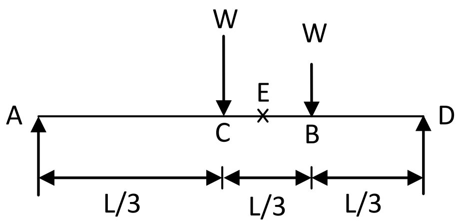
4 (a) Derive the expression for maximum shear stress in a circular section.

(b) A rectangular beam 100 mm wide & 250 mm deep, subjected to maximum shear force of 50 kN. Determine:
(i) Average shear stress.
(ii) Maximum shear stress.
(iii) Shear stress @ distance of 25 mm above neutral axis.

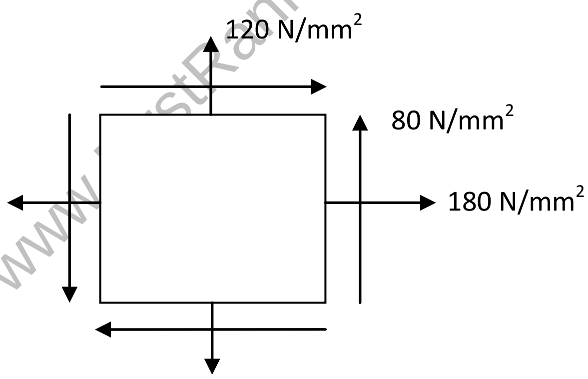
5 (a) Derive an expression for slope & deflection for a cantilever beam subjected to UDL of $10\ kN/m$ over the entire span by using double integration method.

(b) A cantilever of length 3 m carrier a point load of 25 kN at free end. If the moment of inertia of beam is 10^8 mm^4 & $E = 2.1 \times 10^5\ N/mm^2$. Find: (i) Slope at free end. (ii) Deflection at free end.

6 Determine the slope & deflection at mid span & also under the loads in simply supported beam using moment area method.



7 For the given figure below.
Determine: (i) Magnitude of principal stress.
(ii) Direction of principal planes.
(iii) Magnitude of maximum shear stress.
(iv) Magnitude of normal, tangential & resultant stresses.



8 Determine the diameter of a bolt which is subjected to axial pull of 9 kN together with a transverse shear force of 4.5 kN using maximum principal strain theory.
Given: Elastic limit in tension = 225 N/mm^2
Factor of safety = 3
Poisson's ratio = 0.3.

*****