Sub Code: R2021012 **R20** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM
II B. Tech I Semester Supplementary Examinations, November – 2024
STRENGTH OF MATERIALS-I
(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
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1 a) A tensile test was conducted on a mild steel bar. The following data was obtained from the test: [7M]
Diameter of the steel bar = 4 cm (ii) Gauge length of the bar = 22 cm (iii) Load at elastic limit = 250 kN (iv) Extension at a load of 160 kN = 0.235 mm (v) Maximum load = 390 kN (vi) Total extension = 70 mm (vii) Diameter of rod at failure = 2.35 cm
Determine the Young's modulus, the stress at elastic limit, the percentage of elongation

b) Estimate the values of change in length, breadth and thickness of a steel bar 4.2m long, 35mm wide and 25mm thick. When subjected to an axial pull of 130kN in the direction of its length. Take E=200Gpa and Poisson's ratio = 0.3 [7M]

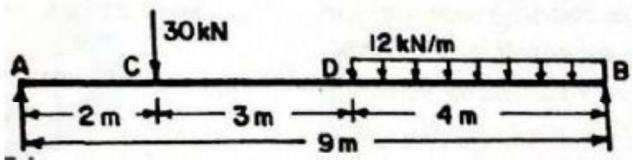
(OR)

2 a) A bar of 25mm diameter is subjected to a pull of 40kN. The measured extension on gauge length of 200mm is 0.085mm and the change in diameter is 0.003mm. Estimate the values of Poisson's ratio and the three moduli [7M]

b) A steel wire 2 m long and 3 mm in diameter is extended by 0.75 mm when a weight W is suspended from the wire. If the same weight is suspended from a brass wire, 2.5 m long and 2 mm in diameter, it is elongated by 4.64 mm. Determine the modulus of elasticity of brass if that of steel be 2.0 x 105 N/mm^2 . [7M]

3 a) The simply supported beam carries a vertical load that increases uniformly from zero at the left end to a maximum value of 8000 N/m at the right end. Draw the shearing force and bending moment diagrams [7M]

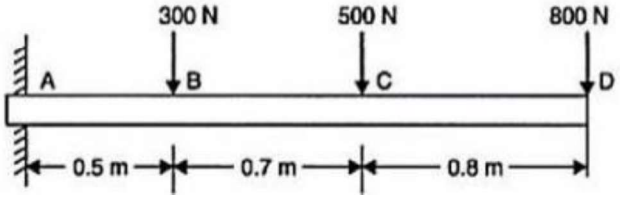
b) A simply supported beam of 9 m span is as shown in figure given below. Draw the B.M and S.F diagram indicating principal values. [7M]



(OR)

4 a) A cantilever beam of span L carries a uniformly varying load varying from zero at the free end to w kN/m at the fixed end. Draw the shear force and bending moment diagrams. [7M]

b) A cantilever beam of length 2 m carries the point loads as shown in Fig. Draw the shear force and B.M. diagrams for the cantilever beam. [7M]



5 a) A timber beam 120 mm wide and 200 mm deep is simply supported over a span of 4 m. The beam carries a UDL of 2.8 KN/m over the entire length. Find the maximum bending stress induced. Plot the bending stress distribution at the quarter span cross section of the beam [7M]

b) A timber beam of rectangular section is to support a load of 30 k N uniformly distributed over a span of 4 m when beam is simply supported. If the depth of section is to be twice the breadth, and the stress in the timber is not to exceed 8 N/mm^2, find the dimensions of the cross section [7M]

(OR)

6 a) A steel beam of I –section, 200 mm deep and 160 mm wide has 16 mm thick flanges and 10 m thick web. The beam is subjected to a shear force of 200 KN. Determine the shear stress distribution over the beam section. [7M]

b) A simply supported beam carries a uniformly distributed load of intensity 30 N/mm over the entire span of 2 m. The cross section of beam is a T-section having flange 125 x 25 mm and web 175 x 25 mm. Calculate the maximum shear stress for the section subjected to maximum shear force. Also draw the shear stress distribution [7M]

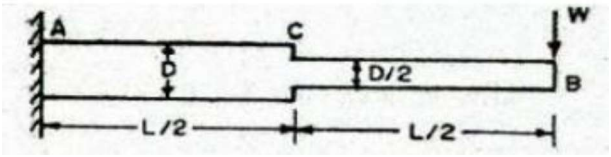
7 a) A beam 3 m long, simply supported at its ends, is carrying a point load W at the centre. If the slope at the ends of the beam should not exceed 1^o, find the deflection at the centre of the beam [7M]

b) A cantilever of uniform section has a length AB = L. End B is free end and carries a point load W, while end A is fixed end. Find the slope and deflection at a point at a distance of L/4 from the free end A. [7M]

(OR)

8 a) Determine the slope and deflection of a simply supported beam carrying a uniformly distributed load by Mohr's theorem [7M]

b) A cantilever of length L carries a point load W at its free end. The member is circular in section, having diameter D for a distance L/ from the fixed end and a diameter D/2 for the remaining length. Find the deflection at the free end. [7M]



9 a) A steel tube of 200 mm external diameter is to be shrunk on to another steel tube of 60 mm internal diameter. After shrinking the diameter at the junction is 120 mm. Before shrinking on the difference of diameter at the junction is 0.08 mm. Find the hoop stresses developed in the two tubes after shrinking on and the radial pressure at the junction. Take E= 2x 10^5 N/mm^2 [7M]

b) Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure and hoop stress distribution across the section. [7M]

(OR)

10 a) A cylindrical thin drum 80 cm in diameter and 3 m long has a shell thickness of 1 cm. If the drum is subjected to an internal pressure of 2.5 N/mm^2, determine (i) change in diameter (ii) change in length and (iii) change in volume. Take E= 2x 10^5 N/mm^2 Poisson's ratio 0.25. [7M]

b) A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made of steel plate 3 mm thick. The length and the internal diameter of the vessel are 50 cm and 25 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 3 N/mm^2. Also calculate the increase in length, diameter and volume of the vessel. Take E as 2x 10^5 N/mm^2 and Poisson's ratio 0.3. [7M]

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