BTS (C) 064 (E)

B.Tech. Degree III Semester Examination
November 2002

CE/SE 303 STRENGTH OF MATERIALS

(1999 Admissions onwards)

Time: 3 Hours Maximum Marks: 100

I. (a) Explain briefly:
(i) Poisson's ratio and shear modulus
(ii) Proof resilience and modulus of resilience (8)

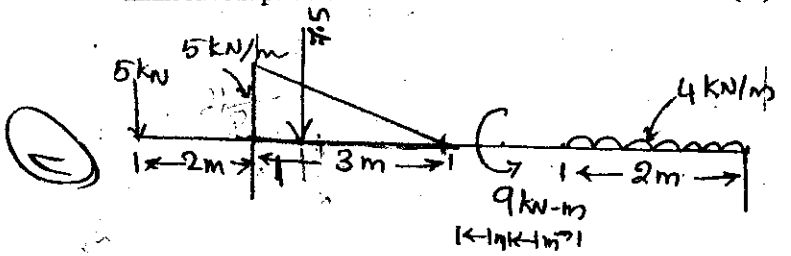
(b) ABC is a stepped bar subjected to an axial pull of 80kN. For the material of the bar, Young's modulus is 200GPa. The length and diameter of the portion is as follows: AB = 40mm dia, 80mm long. BC = 20mm internal dia and 40mm ext. dia for 120mm. Determine the total strain. What will be the diameter of the bar if the bar is of solid section throughout for the same strain? (12)

OR

II. (a) Prove that the sum of normal stresses on any two mutually perpendicular planes is a constant in a two dimensional stress system and is equal to the sum of the two principal stresses. (8)

(b) Determine the normal and tangential stress on a plane inclined at 60 degree with horizontal in an element subjected to 120MPa tensile along X direction and 60MPa along Y direction compressive along with a positive shear of 30MPa. Also determine the principal stresses and its planes by Mohr's circle method. (12)

III. Draw SFD and BMD for the beam shown in figure. And mark salient poins and values. (20)



OR

(Turn over)

8

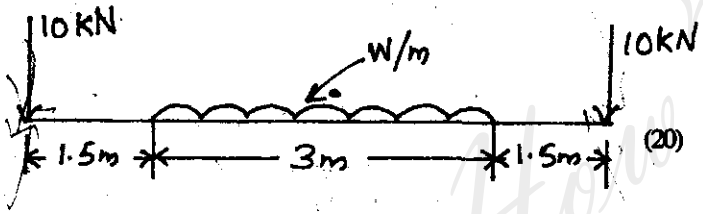
IV. (a) Explain the following:
(i) Pure bending
(ii) beams of uniform strength (6)

(b) A cantilever of square cross section 200 x 200mm 2m long fails when a load of 12kN is placed at its free end. A beam of the same material and having rectangular cross section 150mm wide and 300mm deep is simply supported over a span of 3m. Calculate the concentrated load applied at a distance 1m from left end required to break the beam. (14)

V A cantilever of span 4m carries a udl of 2kN/m from free end to midpoint of the beam. Calculate the slope and deflection at the free end by moment area method. (20)

OR

VI A beam is loaded as shown in figure. Determine the intensity of load w such that the deflection at the center of the beam is equal to the deflection at the free end. EI constant.



(20)

VII. (a) What are the assumptions and limitations of Euler's theory of buckling? (6)

(b) A straight cylindrical bar 15mm dia and 1.25m long is freely supported at its two ends in a horizontal position and loaded at the center with a point load of 100N. The central deflection is found to be 5mm. If placed vertical and loaded along its axis what load would cause it to buckle? What is the ratio of maximum stresses in the two cases? (14)

OR

Contd.....3.

VIII. (a) Show that the hollow shaft is stronger than a solid shaft in torsion for a given material length and weight. (10)

(b) Find Euler's buclking load for a hollow cylindrical CI column 120mm ext. dia and 20mm thick. The column is 4.2m long, one end fixed and other end hinged. E=80kN/mm². (10)

IX. The maximum stress permitted in a thick cylinder of internal and external radii 200mm and 300mm respectively is 15.5N/mm². If the external pressure is 4N/mm², find the internal pressure than can be applied. Plot the curves showing the variation of hoop and radial stresses across the thickness. (20)

OR

X. (a) Explain St.Venant theory of maximum strain of failure. (5)

(b) The circular cross section of a bolt is required to resist an axial tension of 15kN and a transverse shear of 10kN. Estimate the dia of bolt by (i) maximum strain energy theory (ii) shear strain energy theory. Elastic limit of material 300N/mm², Poisson's ratio 0.25. Factor of safety 3. (15)

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