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09ENG2.5

Second Semester B.Arch. Degree Examination, June/July 2013
Structures - II

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions.***
2. Do not scale the drawing, follow written dimensions.

1 a. Explain with neat sketch, stress strain diagram for a mild state specimen and indicate the salient points. **(07 Marks)**

b. Define : "Principle of super position" factor of safety. **(05 Marks)**

c. A copper rod 500 mm long, has a diameter of 30 mm over a length of 200 mm, a diameter of 20 mm over a length of 200 mm, and a diameter of 10 mm over its remaining length. Determine the stresses in each portion and total elongation if the rod is subjected to a pull of 30 kN. Take E = 100 kN/mm^2. **(08 Marks)**

2 a. A member of rectangular section has a constant thickness of 't'. The width tapers from B to b in a length of Lmts. Derive an expression for elongation of member due to axial pull. **(10 Marks)**

b. Find the change in length for a given member of constant thickness 20 mm. The details of dimensions and loads acting is given Fig. 2(b). if E = 12 × 10^3 N/mm^2. **(10 Marks)**

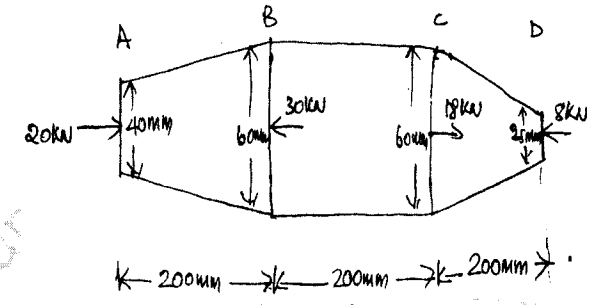

Fig. Q2(b)

3 a. Two vertical rods of steel and copper are rigidly fixed. With the ceiling at their upper end at 100 cms apart. Each rod is 1 mt long and 25 mm in diameter, A horizontal cross piece connects the lower ends of the rods. Where should a load of 3.5 kN be placed on the cross piece, so that it remains horizontal after being loaded. (Refer Fig. Q3(a)). **(10 Marks)**
E_{st} = 2.0 × 10^5 N/mm^2 ; E_{cu} = 10 × 10^5 N /mm^2

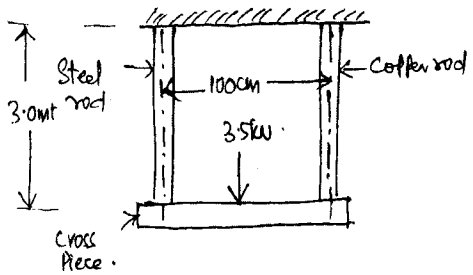

Fig. Q3(a)

b. An aluminimum rod 22 mm diameter passes through a steel tube of 25 mm internal diameter and 3 mm thick. The rod and tube are fixed at temperature 180°C. Find the stresses in the rod and the tube when the temperature falls to 60°C. E_{st} = 200 kN//mm^2 E_{Al} = 70 kN//mm^2 α_{st} = 12 × 10^{-6} /°C α_{Al} = 23 × 10^{-6} /°C. **(10 Marks)**

4 a. Define :
i) Poisson's ratio ii) Shear modulus iii) Bulk modulus iv) Volumetric strain. **(06 Marks)**

b. Derive an equation for volumetric strain of rectangular section subjected to an axial force. **(07 Marks)**

c. A rectangular block 200 mm × 150 mm × 50 mmis subjected to axial load as shown in Fig. Q4(c). Find the change in volume if $\mu = 0.35$ and $E = 2.0 \times 10^5$ N/mm^2. **(07 Marks)**

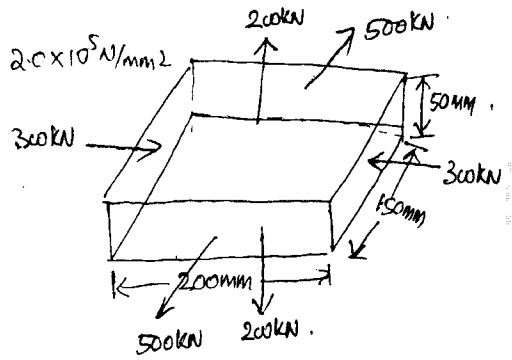

Fig. Q4(c)

5 a. Define shearing force, bending moment and point of contra flexure. Is bending moment and moment one and the same. Comment. **(08 Marks)**

b. A simply supported beam is shown in Fig. Q5(b). Draw the shearing force diagram and bending moment diagram. **(12 Marks)**

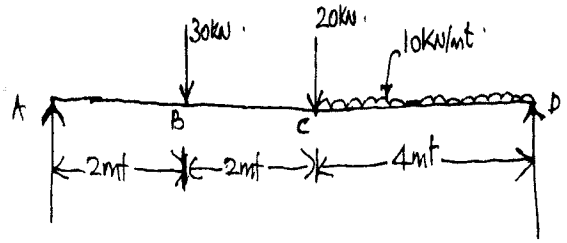

Fig. Q5(b)

6 a. Obtain a relationship between the intensity of load, shearing force and bending moment. **(06 Marks)**

b. For a beam subjected to forces shown in Fig. Q6(b) determine the magnitude of ' P' such that reactions are equal at the supports. Draw the shearing force diagram and bending moment diagram for the same, mark all the salient points. **(14 Marks)**

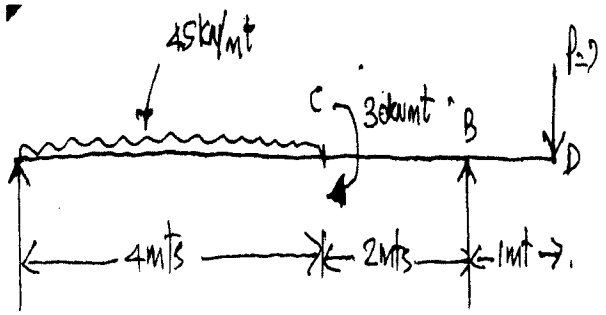

Fig. Q6(b)

7 a. From the 1st principles, derive the bending equation

$$\frac{M}{I}=\frac{F}{Y}=\frac{E}{R}.$$ **(10 Marks)**

b. The cross section of east iron I section is shown in Fig. Q7(b). if tensile stresses is not exceed 30 N/mm^2 and compressive stress is not to exceed 90 N/mm^2. What is the maximum udl the beam can carry over a simply supported beam of span 6 mts. **(10 Marks)**

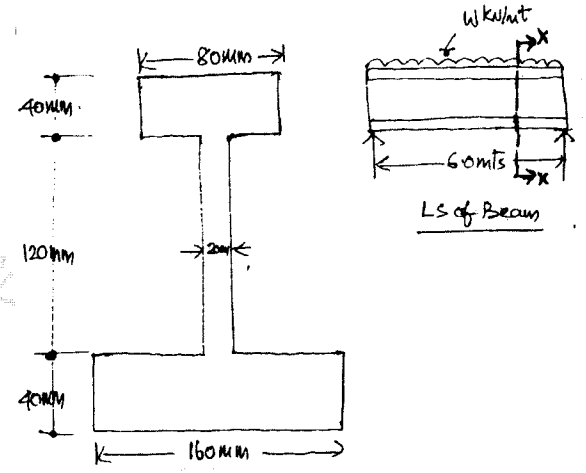

Fig. Q7(b)

8 a. A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum shear force of 50 kN. Determine :

i) Average shear stress
ii) Maximum shear stress
iii) Shear stress at a distance of 25 mm above the neutral axis. **(10 Marks)**

b. The shear force acting on a section of a beam, is 50 kN. The section of the beam is T section as shown in Fig. Q8(b). The moment of inertia of the section is about its horizontal axis is 314.221 × 10^{4}mm^4. Calculate the shear stress at neutral axis, and junction of the web and flange and in the flange. **(10 Marks)**

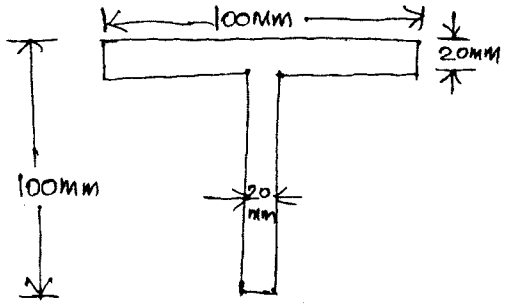

Fig. Q8(b)

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