USN

09ENG2.5

Second Semester B.Arch. Degree Examination, Dec. 2013/Jan. 2014

Structures – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Draw the stress – strain curve for mild steel subjected to tension test and indicate the salient points. **(08 Marks)**

b. A specimen of steel 25 mm diameter with the gauge length of 200 mm is tested in tension. It has an extension of 0.16 mm under a load of 80 kN. The load at elastic limit is 160 kN maximum load is 180 kN. The total extension at the fracture is 56 mm and diameter at neck is 18 mm. Find :

i) Stress at elastic limit
ii) Young's modulus (E)
iii) Percentage elongation
iv) Percentage reduction in area
v) Ultimate stress. **(12 Marks)**

2 a. Define :

i) Young's modulus
ii) Bulk modulus
iii) Poisson's ratio
iv) Modulus of rigidity. **(08 Marks)**

b. The bar shown in Fig. Q2(b) is subjected to axial tensile force of 40 kN the total extension of the bar is 0.285 mm. Determine the young's modulus of the material. **(12 Marks)**

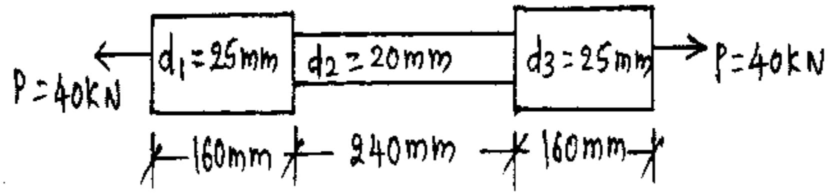

Fig. Q2(b)

3 a. A bar of uniform thickness 't' tapers uniformly. Derive an expression for elongation of the bar uniformly varying from a width of b_1 at one end to b_2 at other end in a length L. when subjected to an axial force P. **(10 Marks)**

b. A 1.5 m long steel bar is having uniform diameter of 40 mm for a length of 1 m and in the next 0.5 m its diameter gradually reduces from 40 mm to 20 mm as shown in Fig. Q3(b). Determine the elongation of the bar when subjected to an axial tensile load of 160 kN. $E = 2 \times 10^5$ N/mm^2. **(10 Marks)**

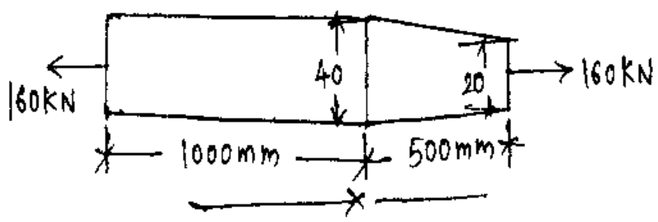

Fig. Q3(b)

4 a. Obtain the relationship between bulk modulus and Young's modulus in the form $E = 3k(1 - 2\mu)$. **(08 Marks)**

b. A 500 mm long bar has rectangular cross – section 20 mm × 40 mm
This bar is subjected to
i) 40 kN tensile force on 20 mm × 40 mm face
ii) 200 kN compressive force on 20 mm × 500 mm face
iii) 300 kN tensile force on 40 mm × 500 mm face
Find the change in volume if $E = 2 \times 10^5$ N/mm^2, and $\mu = 0.3$. **(12 Marks)**

5 a. Define bending moment, shear force and point of contra flexure. **(06 Marks)**

b. Draw SFD and BMD for beam shown in Fig. Q5(b). **(14 Marks)**

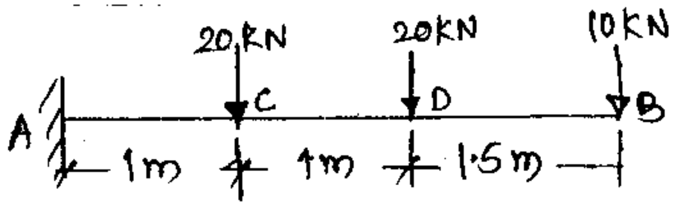

Fig. Q5(b)

6 a. Obtain the relationship between the load intensity, shear force and BM. **(06 Marks)**

b. Draw SFD and BMD for beam shown in Fig. 6(b). **(14 Marks)**

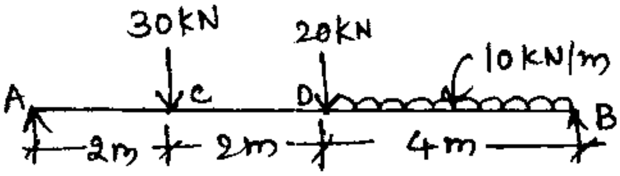

Fig. Q6(b)

7 a. Write the assumptions made in the theory of pure bending. **(08 Marks)**

b. A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span 2.5 m. Find the maximum concentrated load that can be applied at the centre of the span if permissible stress in tube is 150 N/mm^2. **(12 Marks)**

8 a. Prove that for a rectangular section the maximum shear stress is 1.5 times average shear stress. **(08 Marks)**

b. The unsymmetrical I – section shown in Fig. Q8(b) is subjected to a shear force of 40 kN. Draw the shear stress variation diagram across the depth. **(12 Marks)**

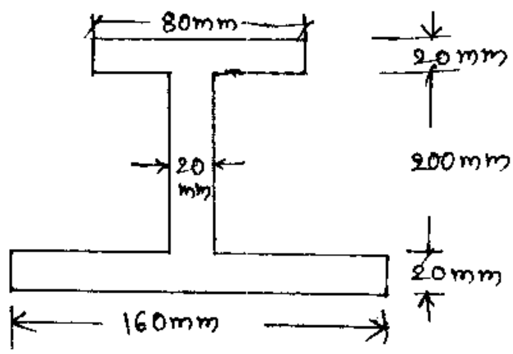

Fig. Q8(b)

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