CBCS SCHEME

USN | | | | | | | | | | | **18ENG25**

Second Semester B.Arch. Degree Examination, Dec.2023/Jan.2024
Building Structures - II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define i) Tensile stress ii) Shear stress iii) Hookes Law iv) Factor of Safety. **(04 Marks)**

b. An axial pull of 35000N is acting on a bar consisting of three lengths as shown in Fig. Q1(b). If the Young's modulus $E = 2.1 \times 10^5$ N/mm^2. Determine
i) Stress in each section ii) Total extension of the Bar. **(10 Marks)**

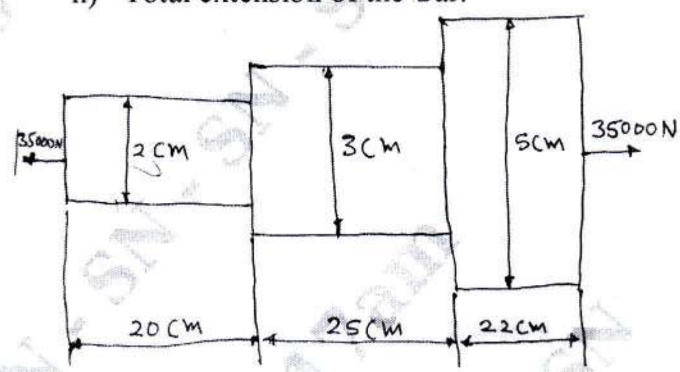


Fig. Q1(b)

c. A Brass bar having cross – sectional area 300 mm^2 is subjected to axial forces as shown in Fig. Q1(c). Find the elongation of the Bar E = 84 GPa. **(06 Marks)**

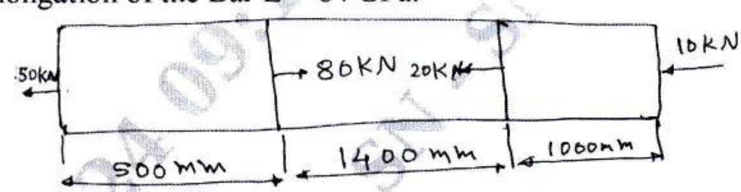


Fig. Q1(c)

OR

2 a. With the help of neat sketch, explain Stress – Strain curve of Mild steel specimen. **(08 Marks)**

b. Explain briefly : i) Poisson's Ratio ii) Bulk modulus iii) Volumatric strain
iv) Rotation between E & G. **(04 Marks)**

c. A 1.5m long steel bar is having uniform diameter of 40mm for a length of 1m and in the next 0.5m its diameter gradually reduces from 40mm to 20mm as shown in Fig. Q2(c). Determine the elongation of this bar when subjected to an axial tensile load of 160kN.
Given E = 200 GN/m^2. **(08 Marks)**

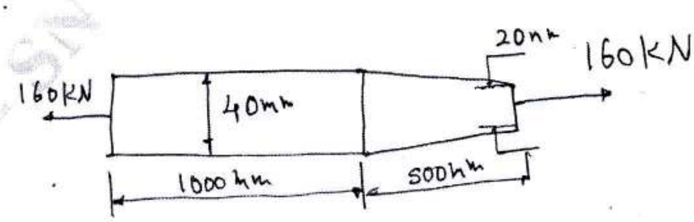


Fig. Q2(c)

Module-2

3 a. Define Shear force and Bending moment with sign convention. **(06 Marks)**

b. Calculate Shear force and Bending moment and draw SFD and BMD for Fig. Q3(b). **(14 Marks)**

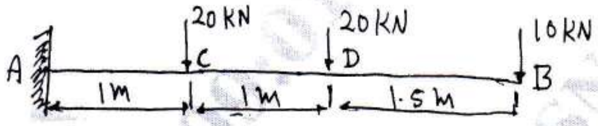


Fig. Q3(b)

OR

4 a. Draw SFD and BMD for a Cantilever beam subject to UDL of W kN/m for the whole length 'ℓ'. **(06 Marks)**

b. A simply supported beam of length 6m, carries point load of 3kN and 6kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment. Diagrams for the beam. **(14 Marks)**

Module-3

5 a. State the assumptions made in theory of Simple Bending. **(06 Marks)**

b. The T section in Fig. Q5(b) is used as a simply supported beam over a span of 8m. It carries a udl of 1.5kN/m over its entire span. Calculate the maximum tensile and compressive stresses occurring in the section. **(14 Marks)**

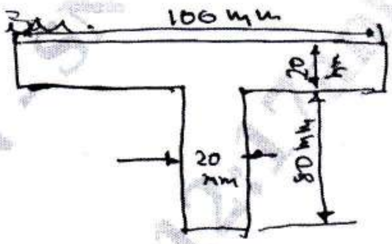


Fig. Q5(b)

OR

6 a. A rectangular beam 100mm wide and 250mm deep is subjected to a maximum shear force of 50kN. Determine i) Average shear stress ii) Maximum shear stress
iii) Shear stress at a distance of 25mm above the Neutral axis.
iv) Shear stress at N.A. **(10 Marks)**

b. An I – section beam 350mm × 150mm has a web thickness of 10mm and a Flange thickness of 20mm. If the shear force acting on the section is 40kN, find the maximum shear stress developed in the I – section. **(10 Marks)**

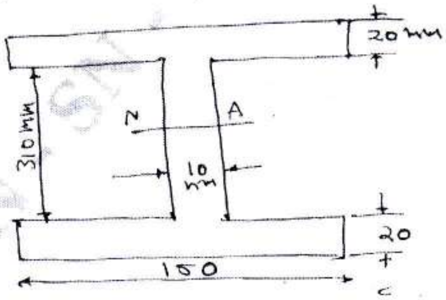


Fig. Q6(b)

Module-4

7 a. Define Slenderness Ratio and Buckling load. **(04 Marks)**

b. Explain the limitations of Euler's theory. **(06 Marks)**

c. A build up I – section has an overall depth of 400mm , Width of Flanges 300mm , Thickness of flanges 50mm and Web thickness 30mm. Simply supported ends and it deflects by 10mm when subjected to a load of 40kN/m length. Find the safe load if this I – section is used as a column with both ends hinged. Use Euler's formula. Assume a Factor of safety 1.75 and take $E = 2 \times 10^5$ N/mm^2. **(10 Marks)**

OR

8 a. A 1.5m long column has a circular cross section of 50mm diameter, one end of the column is fixed in direction and position and other end is free. Taking the FOS as 3, calculate the safe load using i) Euler's formula taking $E = 1.2 \times 10^5$ N/mm^2.

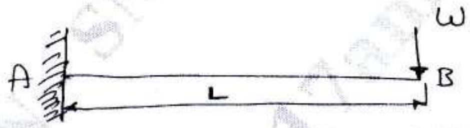
ii) Rankine formula taking Yield stress 560 N/mm^2 and $a = \frac{1}{1600}$. **(10 Marks)**

b. A hollow circular section 2.8m long column , one end fixed and hinged at other end. External diameter is 150mm and thickness of wall is 15mm. Rankine's constant = $\frac{1}{1600}$ and σ_c = 550 MPa. Compare the buckling loads. Obtained by Euler's formula and Rankine's formula. Take E = 80 GPa. **(10 Marks)**

Module-5

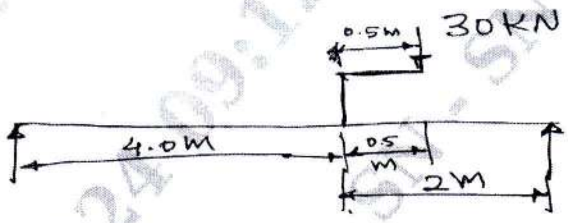
9 a. Determine the maximum slope and maximum deflection for a cantilever beam shown in Fig. Q9(a) in terms of EI. **(10 Marks)**

Fig. Q9(a)



b. Find the deflection at 'C' for the beam shown in Fig. Q9(b). $EI = 1 \times 10^{13}$ N mm^2. Use Macaulay's method. **(10 Marks)**

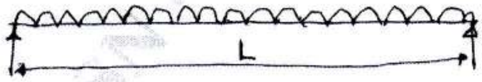
Fig. Q9(b)



OR

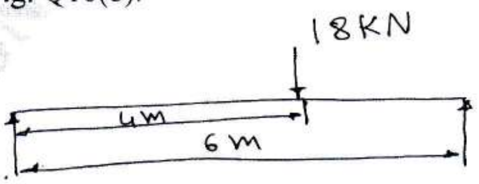
10 a. Determine the slope at supports and maximum deflection of the beam shown in Fig. Q10(a) in terms of EI. **(10 Marks)**

Fig. Q10(a)



b. Determine the i) Slope at mid point and ii) Deflection under the load. EIS 200GPa. $I = 15 \times 10^6$ mm^4. Refer Fig. Q10(b). **(10 Marks)**

Fig. Q10(b)



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