CBCS SCHEME

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18ENG25

Second Semester B.Arch. Degree Examination, Dec.2025/Jan.2026
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) Stress and Strain (ii) Hooke's Law and Young's Modulus (iii) Tensile Stress and Compressive Stress (iv) Poisson's Ratio (v) Factor of Safety **(10 Marks)**

b. A stepped bar of circular cross-section 2000 mm length is subjected to an axial load of 50×10^3 N. Find the stress in each section, strain and deformation in each section and total deformation. Take $E = 206\times10^3$ N/mm^2. [Refer Fig.Q1(b)]

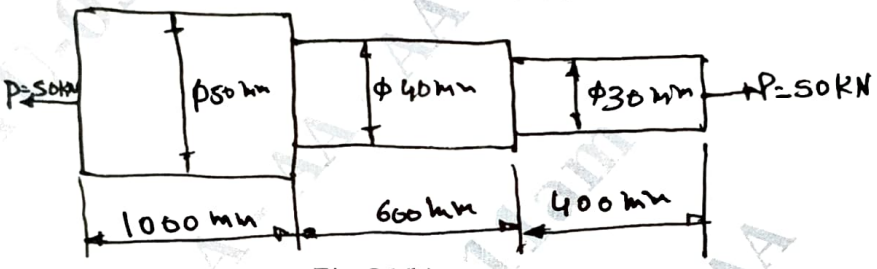

Fig.Q1(b) **(10 Marks)**

OR

2 a. Draw and explain Stress-Strain Diagram of a mild steel specimen subjected to tension test. **(06 Marks)**

b. A rod, which tapers uniformly from 40 mm diameter to 20 mm diameter in a length of 400 mm is subjected to an axial load of 5000 N. If $E = 2.1\times10^5$ N/mm^2. Find the extension of the rod. **(04 Marks)**

c. A bar of 20 mm diameter is subjected to a pull of 50×10^3 N. The measured extension of gauge length of 250 mm is 0.12 mm and change in diameter is 0.00375 mm. Determine (i) Longitudinal strain and lateral strain (ii) Young's modulus (E) (iii) Poisson's ratio (μ) (iv) Bulk Modulus (K) (v) Modulus of Rigidity (G). **(10 Marks)**

Module-2

3 a. Define shear force and bending moment with sign conventions. **(06 Marks)**

b. Calculate shear force and bending moment and draw SFD and BMD for Fig.Q3(b).

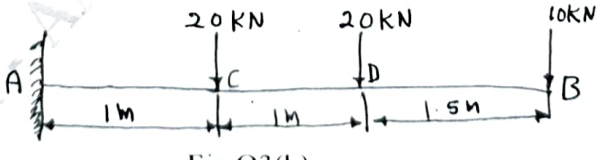

Fig.Q3(b) **(14 Marks)**

OR

4 a. Draw SFD and BMD for a cantilever beam subjected to UDL of w KN/m for the whole length "l". **(06 Marks)**

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

Module-3

5 a. Define : (i) Section Modulus (ii) Pure Bending (iii) Neutral axis. **(06 Marks)**

b. What are the assumptions made in simple theory of bending? **(04 Marks)**

c. A Rolled steel joint at I section has the dimensions as shown in Fig.Q5(c). This beam of I - section carries a Udl of 40 N/mm run over the span of 10 m. Calculate the maximum stress produced due to bending.

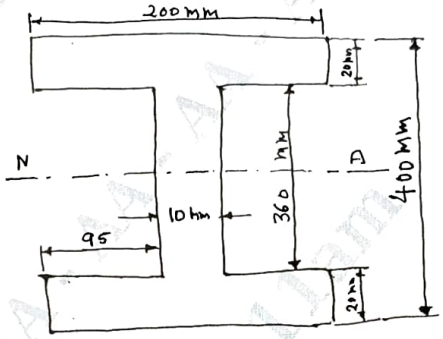

Fig.Q5(c) **(10 Marks)**

OR

6 a. Write the shear stress equation for Beam and expand each of the notations in the equation. **(04 Marks)**

b. 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 **(06 Marks)**

c. The shear force acting on a section of a beam is 50 KN. The section of the beam is of T-shaped of dimensions 100 mm × 100 mm × 20 mm as shown in Fig.Q6(c). The moment of inertia about the horizontal axis is 314.221×10^4 mm^4. Calculate the shear stress at the neutral axis and at the junction of the web and the flange.

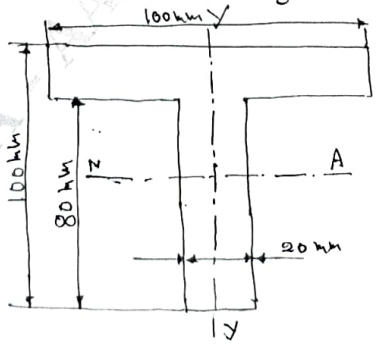

Fig.Q6(c) **(10 Marks)**

Module-4

7 a. Define : (i) Column (ii) Critical load (iii) Effective length of the column (iv) Slenderness ratio. **(08 Marks)**

b. Write the Euler's formula and expand each of the notations in the equation. **(04 Marks)**

c. A solid round bar 3 m long and 50 mm in diameter is used as a column determine the critical load using Euler's formula for the following conditions:
i) Both the ends of column are fixed
ii) One end of the column is fixed and the other end free
iii) Both the ends of the column are hinged
Take $E = 2.0 \times 10^5$ N/mm^2. **(08 Marks)**

OR

8 a. What are the assumptions made in Euler's theory? **(05 Marks)**

b. What is the "limitations of Euler's theory"? **(05 Marks)**

c. An aluminium pipe column of length 3 m has inside and outside diameter of 125 mm and 150 mm respectively. Determine the critical loads for the following conditions:
i) Both ends hinged.
ii) One end fixed and one end free.
iii) Both ends fixed.
iv) One end fixed, one end hinged.
$E = 7 \times 10^4$ N/mm^2. **(10 Marks)**

Module-5

9 a. Define slope and deflection. **(02 Marks)**

b. Derive an expression for maximum slope and deflection for a cantilever beam subjected to a concentrated load at the free end. **(10 Marks)**

c. A beam 6 m long simply supported at its ends, is carrying a point load of 50 KN at its center. The moment of inertia of the beam is given as equal to 78×10^6 mm^4. If E for the material of the beam = 2.1×10^5 N/mm^2. Calculate
i) Deflection at the centre of the beam (ii) Slope at the supports. **(08 Marks)**

OR

10 a. Write the assumptions made in the Moment Curvature Equation. **(04 Marks)**

b. Derive an expression for maximum slope and deflection for a cantilever beam subjected to a UDL. **(10 Marks)**

c. A cantilever beam of length 3 m is carrying a point load of 25 KN at the free end. If the moment of inertia of the beam = 10^8 mm^4 and value of $E = 2.1 \times 10^5$ N/mm^2.
Find : (i) Slope of the cantilever at the free end (ii) Deflection at the free end. **(06 Marks)**

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