CBCS SCHEME

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21ARC36/ENG36

Third Semester B.Arch. Degree Examination, June/July 2025
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) Elastic Limit ii) Hooke's Law. **(05 Marks)**

b. A brass bar, having cross-sectional area of 500 mm^2 is subjected to axial forces as shown in Fig Q1(b). Find the total elongation of the bar. Take E = 80 GPA.

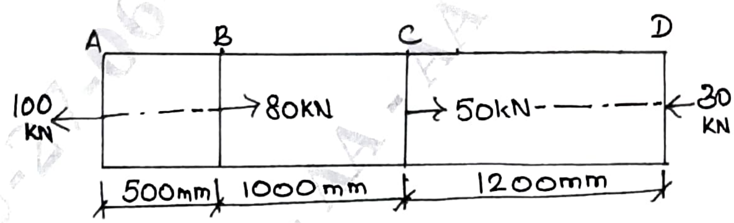

Fig Q1(b) **(08 Marks)**

c. A hollow cylinder 2 m long has an outside diameter of 50 mm and inside diameter of 30 mm. If the cylinder is carrying a load of 25 kN, find the stress in the cylinder. Also find the deformation of the cylinder, if the value of modulus of elasticity for the cylinder material is 100 GPa. **(07 Marks)**

OR

2 a. Explain the principle of superposition. **(05 Marks)**

b. A steel bar of variable section is subjected to forces as shown in Fig Q2(b). Taking E = 205kN/m^2, determine the total elongation of the bar.

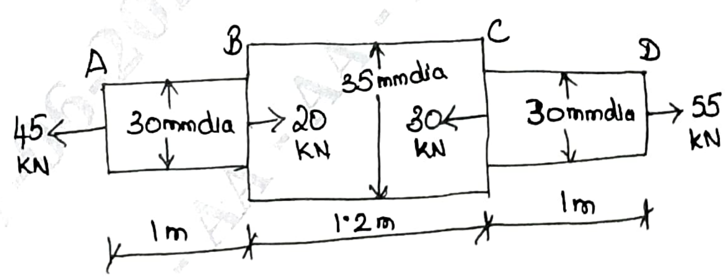

Fig Q2(b) **(07 Marks)**

c. A tensile load of 50 kN is acting on the rod of 50 mm diameter and length of 5m. Determine the length of the bore of 25 mm that can be made central in the rod, if the total extension is not to exceed 25 percent under the same tensile load. Take E = 2.05 × 10^5 N/mm^2. **(08 Marks)**

Module-2

3 a. Define :
   i) Modulus of Elasticity
   ii) Modulus of Rigidity
   iii) Bulk Modulus
   iv) Poisson's Ratio **(10 Marks)**

b. A reinforced concrete column 500 mm × 500 mm in section is reinforced with 4 steel bars of 25 mm diameters. One in each corner. The column is carrying a load of 1000 kN. Find the stresses in concrete and steel bars. Take E for steel = 210 GPa and E for concrete = 14 GPa. **(10 Marks)**

OR

4 a. Explain Thermal stresses in simple bars. **(05 Marks)**

b. A bar of steel has rectangular cross section 30 mm × 20 mm. Find the dimensions of the sides and percentage decrease of area of cross – section. When it is subjected to a tensile force of 120 kN in the direction of its length. Take $E = 2 \times 10^5$ N/mm^2 and m = 10/3. **(05 Marks)**

c. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate: i) Young's modulus ii) Poisson's Ratio iii) Bulk modulus iv) Modulus of Rigidity. **(10 Marks)**

Module-3

5 a. State the assumptions made in Euler's column theory. **(05 Marks)**

b. Discuss the limitations of Euler's formula. **(05 Marks)**

c. A bar of length 4 m when used as a simply supported beam and subjected to a uniformly distributed load of 30 kN/m over the whole span deflects 15 mm at the centre. Determine the crippling loads when it is used as a column with following conditions.
i) Both ends pin ii) One end fixed and other end hinged iii) Both ends fixed. **(10 Marks)**

OR

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

b. An I-section joist ISWB 400 and 8 m long is used as a strut with both ends fixed. Taking $E = 2 \times 10^5$ N/mm^2, determine Euler's Crippling load.
Given for the section $I_{xx} = 23426.7$ cm^4
$I_{yy} = 1388.0$ cm^4 **(05 Marks)**

c. A hollow cast iron cylindrical column 3 m long is hinged at both ends. The external diameters is 150 mm and the internal diameter is 100 mm, using FOS of 4, determine safe load the column can support. Take E = 89.5 kN/mm^2. **(07 Marks)**

Module-4

7 a. Draw the BMD and SFD for a cantilever beam of 1.5 m span as shown in Fig Q7(a).

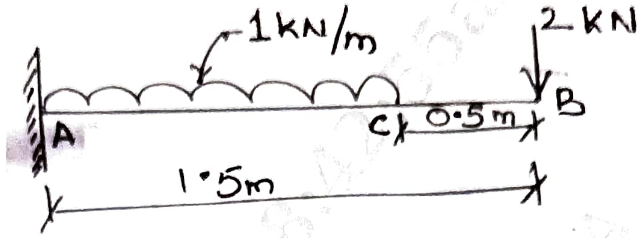

Fig Q7(a) (10 Marks)

b. Draw the BMD and SFD for the simply supported beam as shown in Fig Q7(b).

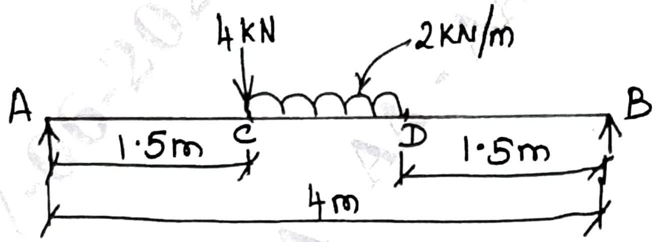

Fig Q7(b) (10 Marks)

OR

8 a. Draw BMD and SFD for the given beam as shown in Fig Q8(a).

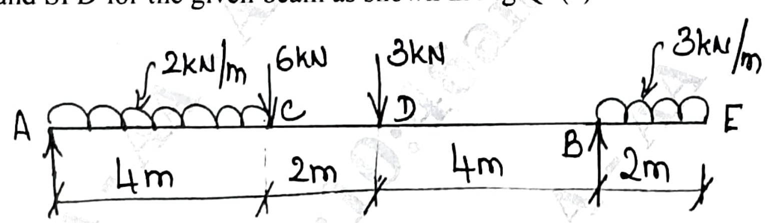

Fig Q8(a) (10 Marks)

b. Draw BMD and SFD for the given beam as shown in Fig Q8(b).

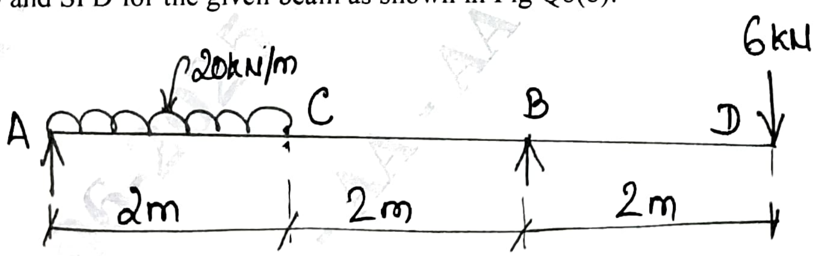

Fig Q8(b) (10 Marks)

Module-5

9 a. Define :

i) Neutral Axis
ii) Section Modulus
iii) Pure Bending. (06 Marks)

b. Write the shear equation for beams and expand each of the notations in the equations. **(04 Marks)**

c. An I-section beam 350 mm × 150 mm has a web thickness of 10 mm and a flange thickness of 20 mm as shown in Fig Q9(c). If the shear stress developed in the I-section.

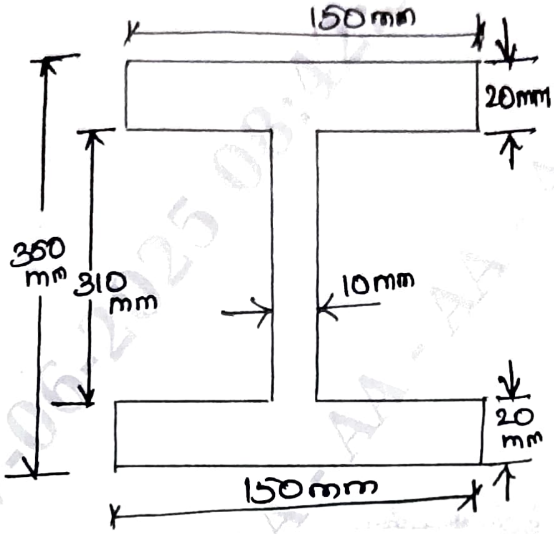

Fig Q9(c) **(10 Marks)**

OR

10 a. Define Simple Bending with an example. **(04 Marks)**

b. State the assumptions made in simple theory of Bending. **(06 Marks)**

c. A cast iron beam is of T-section as shown in Fig Q10(c). The beam is simply supported on a span of 8 m. The beam carries a uniformly distributed load of 1.5 kN/m length on the entire span. Determine the maximum tensile and maximum compressive stresses.

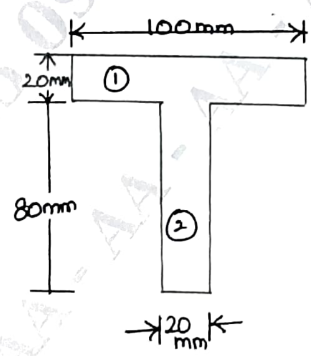

Fig Q10(c) **(10 Marks)**

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