CBCS SCHEME

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21ARC36

Third Semester B.Arch. Degree Examination, June/July 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. With a neat sketch, explain the stress-strain curve for mild steel. **(10 Marks)**

b. An axial pull of 50kN is acting on a bar consisting of three sections of length 300mm, 250mm, 200mm of dia 20mm, 40mm and 50mm respectively. if $E = 2 \times 10^5 N/mm^2$, calculate :
i) Stress in each section
ii) Total elongation. **(10 Marks)**

OR

2 a. Define :
i) Tensile and compressive stress
ii) Hooke's law
iii) Longitudinal and lateral strain
iv) Factor of safety. **(08 Marks)**

b. Write an expression each for elongation of uniformly varying rectangular bar with constant thickness and of uniformly varying circular rod subjected to axial tension. **(06 Marks)**

c. A brass bar, having cross sectional area of $1000mm^2$, is subjected to axial forces as shown in Fig.Q2(c). Find the total elongation of the bar $E = 1.05 \times 10^5 N/mm^2$.

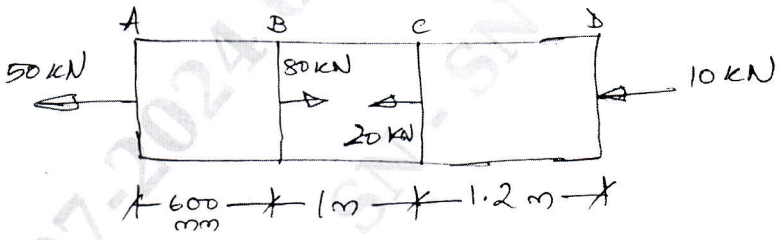

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Define the following with suitable formula :
i) Bulk modulus
ii) Rigidity modulus
iii) Modulus of elasticity
iv) Temperature stresses. **(10 Marks)**

b. A reinforced concrete column 500mm × 500mm in section is reinforced with 4 steel bars of 25mm diameter placed at each corner. The column carries an axial load of 500kN. Find the stresses in both concrete and steel bars.. Take $E_{steel} = 2.1 \times 10^5 N/mm^2$ and $E_{conc} = 0.14 \times 10^5 N/mm^2$. **(10 Marks)**

OR

4 a. Write the different expressions for the relationship between elastic constants. **(06 Marks)**

b. State and explain "Poisson's ratio". **(04 Marks)**

c. A bar is having 20mm dia and 1000mm length. During a tensile test it is found that the longitudinal strain is four times the lateral strain. Calculate the rigidity modulus, bulk modulus, if the young's modulus is $1 \times 10^5 N/mm^2$. Find the change in volume when the bar is subjected to pressure of $100N/mm^2$. **(10 Marks)**

Module-3

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

b. Define :

i) Column

ii) Critical load

iii) Effective length of column

iv) Slenderness ratio. **(08 Marks)**

c. A solid round bar 3m long and 5cm in diameter is used as a column. Determine the critical load using Euler's formula for these conditions. Take $E = 2 \times 10^5 N/mm^2$.

i) Both ends fixed

ii) Both ends hinged

iii) One end fixed, other free. **(06 Marks)**

OR

6 a. State the expressions for "effective length of columns" for various end conditions, with neat sketches (four standard cases). **(08 Marks)**

b. Determine the crippling load for an I – Section with $400 \times 200 \times 10mm$ size having length of 6m used as a start with both ends fixed. Take $E = 2.1 \times 10^5 N/mm^2$. F.S = 3. **(12 Marks)**

Module-4

7 a. Draw SFD and BMD for a cantilever beam subject to UDL of 'w' kN/m for the whole length 'ℓ'. **(10 Marks)**

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

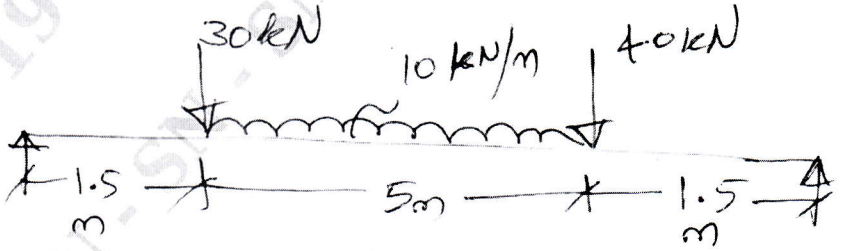

Fig.Q7(b) **(10 Marks)**

OR

8 a. Draw SFD and BMD for a simply supported beam of length 'L' carrying a UDL of 'w' kN/m for the whole length. **(10 Marks)**

b. Draw SFD and BMD for the beam shown in Fig.Q8(b) indicating salient values. Locate the point of contra-flexure if it exists and maximum positive and negative bending moments.

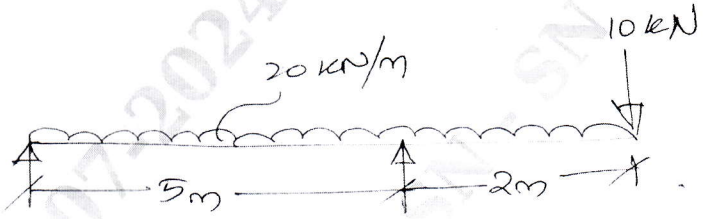

Fig.Q8(b) **(10 Marks)**

Module-5

9 a. Define 'Simple Bending' with an example. What are the assumptions made? **(06 Marks)**

b. State and explain the simple bending equation with usual notations. **(04 Marks)**

c. The T-section shown in Fig.Q9(c) is used as a beam. It is simply supported on a span of 8m. The beam carries a UDL of 1.5kN/m on the entire length. Determine the maximum tensile and compressive stresses.

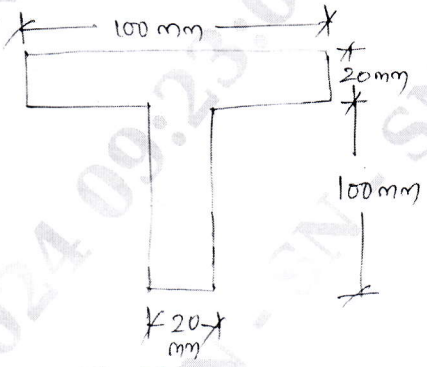

Fig.Q9(c) **(10 Marks)**

OR

10 a. What is section modulus? Write the expression for section modulus for the following :

i) Rectangular section

ii) Hollow rectangular section

iii) Circular section

iv) Hollow circular section. **(10 Marks)**

b. A T – beam having flange 200 × 50mm and a web of 200 × 50mm with overall height 250mm is subjected to a shear force of 120kN. Calculate the shear stresses induced in the section and draw the stress distribution diagram. Take $\bar{Y} = 87.5$mm from top, $I = 113 \times 10^6 mm^4$. **(10 Marks)**

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