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18ENG25

Second Semester B.Arch. Degree Examination, Feb./Mar.2022
Building Structures – II

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Follow written dimension, do not scale the drawing.

Module-1

- 1 a. Explain briefly different types of stresses and strains. (10 Marks)
b. Find the total elongation in the bar and stresses induced in each portion of the bar. Refer Fig. Q1 (b). The Young's modulus of material is $2.0 \times 10^5 \text{ N/mm}^2$. (10 Marks)

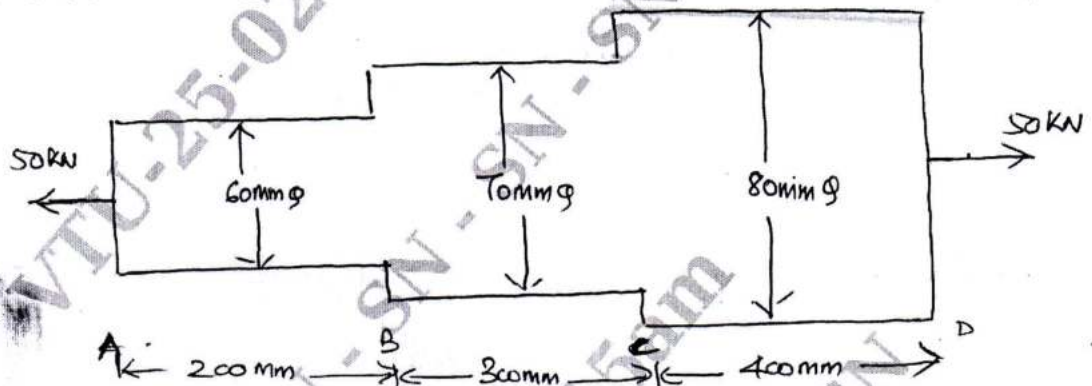


Fig. Q1 (b)

OR

- 2 a. With help of neat sketch, explain stress-strain curve of mild steel specimen. (06 Marks)
b. Find the total strain in the bar, when it is subjected to forces, as shown in Fig. Q2 (b). The cross sectional area throughout is 400 mm^2 . Take $E = 2.0 \times 10^5 \text{ N/mm}^2$. Determine the stresses in each portion. (09 Marks)

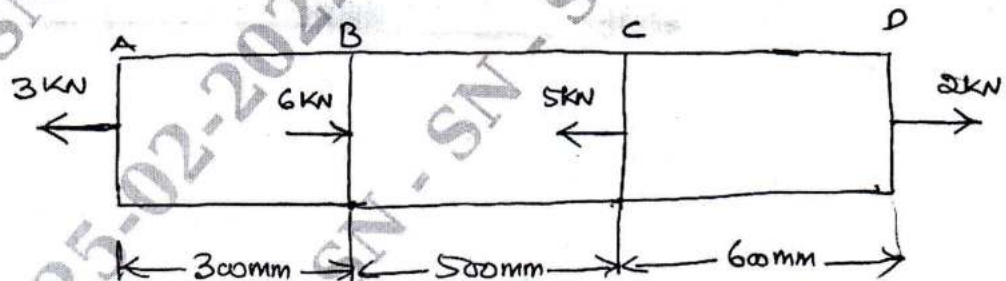


Fig. Q2 (b)

- c. Explain briefly,
(i) Poisson's ratio (ii) Bulk modulus (iii) Volumetric strain. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-2

- 3 Draw the shear force diagram and bending moment diagram for the beams shown in Fig. Q3 (a) and Fig. Q3 (b).

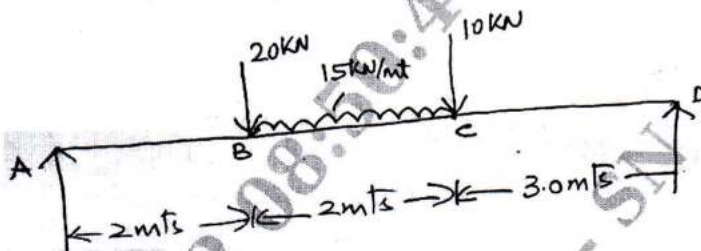


Fig. Q3 (a)

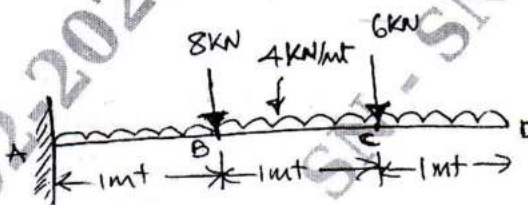


Fig. Q3 (b)

(20 Marks)

OR

- 4 a. Obtain a relationship between LOAD, SHEAR FORCE and BENDING MOMENT. (06 Marks)
 b. Draw the shear force diagram and bending moment diagram for the beam shown in Fig. Q4 (b).

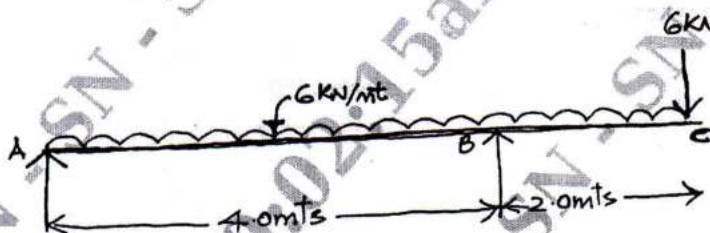


Fig. Q4 (b)

(14 Marks)

Module-3

- 5 a. What are the assumptions made in "Theory of Pure Bending"? (03 Marks)
 b. What is section modulus? Obtain an expression for section modulus for rectangle and circle. (05 Marks)
 c. Determine the bending stresses across the cross section for the beam shown in Fig. Q5 (c).

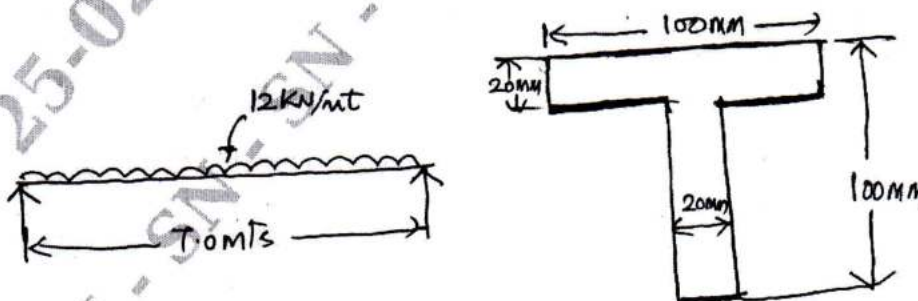


Fig. Q5 (c)

(12 Marks)

OR

- 6 a. From the 1st principles, prove that max shear stress in a rectangular section is 1.5 average shear stress. (10 Marks)
 b. Determine the shear stress variation across the cross section (Refer Fig. Q5 (c)) and sketch the shear stress variation. (10 Marks)

Module-4

- 7 a. Determine the buckling load for a strut in Fig. Q7 (a). The strut is 3 mts long and is hinged at both ends. Take $E = 200 \text{ GN/mt}^2$. (10 Marks)

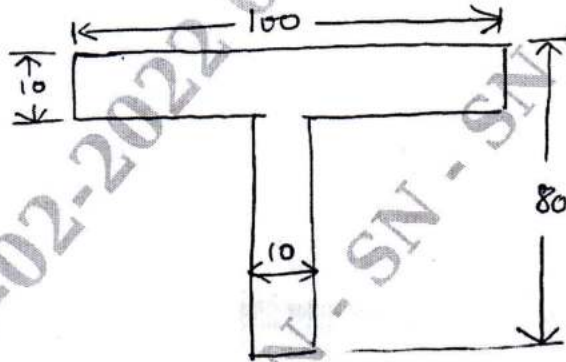


Fig. Q7 (a)

- b. A hollow circular column is 3.5 mts long, both the ends of column are fixed. If $E = 2.0 \times 10^5 \text{ N/mm}^2$. Determine the safe load on the column, take factor of safety as 3.0. The outer diameter is 60 mm and thickness of the column is 5 mm. (10 Marks)

OR

- 8 a. Define Slenderness Ratio and Buckling load. (04 Marks)
 b. Explain the limitations of Euler's theory. (06 Marks)
 c. A built up I section has an overall depth of 400 mm width of flanges 300 mm, thickness of flanges 50 mm and web thickness 30 mm. It is used as a beam with simply supported ends and it deflects by 10 mm, when subjected to a load of 40 kN/mt lengths. Find the safe load if this I section is used as column with both ends hinged. Assume factor of safety = 1.75 and $E = 2.0 \times 10^5 \text{ N/mm}^2$. (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)

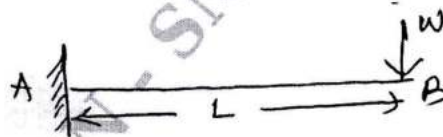
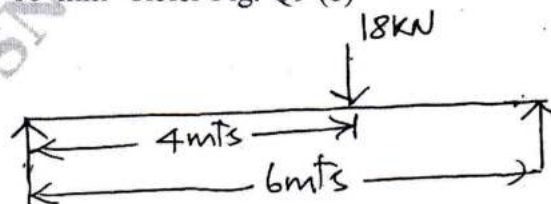


Fig. Q9 (a)

- b. Determine the (i) Slope at mid point and (ii) Deflection under the load. E is 200 GPa, $I = 15 \times 10^6 \text{ mm}^4$ Refer Fig. Q9 (b)



Refer Fig. Q9 (b)

(10 Marks)

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)

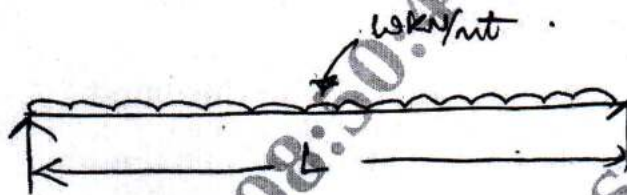


Fig. Q10 (a)

- b. Find the deflection at 'C' for the beam shown in Fig. Q10 (b). $EI = 1 \times 10^{13} \text{ N mm}^2$. (10 Marks)

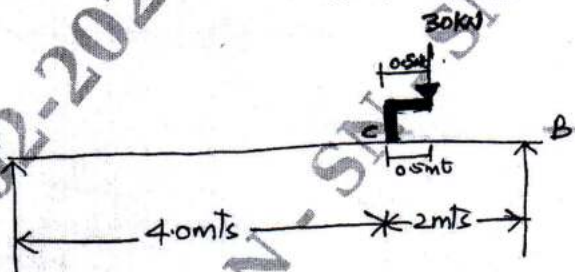


Fig. Q10 (b)
