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15ENG25

Second Semester B.Arch. Degree Examination, July/August 2021
Building Structures – II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. From first principle derive the centroid of a rectangle. **(05 Marks)**

b. Locate the centriod for the composite section shown below. (Ref Fig. Q1 (b)) **(07 Marks)**

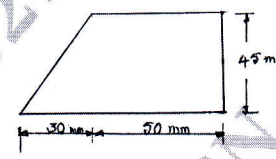

Fig. Q1 (b)

c. For the shaded area shown below, locate the centriod (semicircle cut from rectangle). **(08 Marks)**

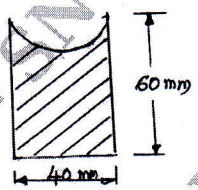

Fig. Q1 (c)

2 a. What is moment of inertia? Explain the significance of moment of inertia for beams and columns. **(06 Marks)**

b. For the T-section shown below in Fig. Q2 (b), determine moment of inertia about centriodal X-X and Y-Y axes and hence find least radius of gyration. **(14 Marks)**

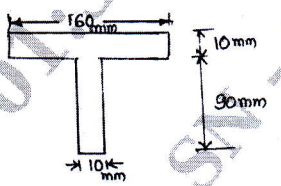

Fig. Q2 (b)

3 a. Define : (i) Shear force (ii) Bending moment (iii) Point of contraflexure. **(06 Marks)**

b. For the Cantilever beam shown below in Fig. Q3 (b), determine shear force and bending moment at all the salient points. Draw SFD and BMD. **(06 Marks)**

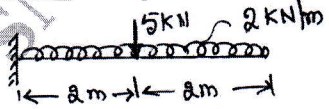

Fig. Q3 (b)

c. Draw shear force and bending moment diagram for the simply supported beam shown below in Fig. Q3 (c). Also find maximum bending moment. **(08 Marks)**

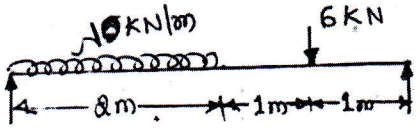

Fig. Q3 (c)

4 An overhanging beam is subjected to forces as shown below in Fig. Q4. Draw SFD and BMD and indicate all the salient points. **(20 Marks)**

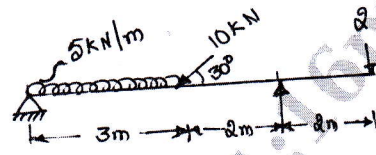

Fig. Q4

5 a. Write pure bending theory equation and explain all the terms. **(05 Marks)**

b. What is section modulus? Calculate the section modulus for the hollow section shown below: **(05 Marks)**

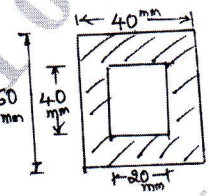

Fig. Q5 (b)

c. A rectangular cross section beam of dimension 60mm × 120mm and length 3 m is simply supported at the ends. The beam is subjected to an udl of 9 kN/m throughout the beam. Determine bending stress and draw bending stress diagram. **(10 Marks)**

6 a. Draw the typical variation of shear stress along the depth of beam for,
(i) Rectangular cross section (ii) T-section. **(08 Marks)**

b. Explain slope and deflection of a beam with neat sketch for a simply supported beam and a cantilever beam. **(05 Marks)**

c. Determine maximum slope and deflection for the simply supported beam shown below in Fig. Q6 (c) using standard formula. **(07 Marks)**

$E = 2 \times 10^5 \text{ N/mm}^2$
$I = 86 \times 10^5 \text{ mm}^4$

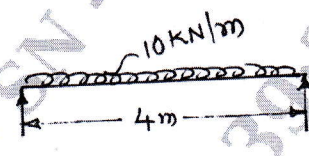

Fig. Q6 (c)

7 a. Define (i) Column (ii) Slenderness ratio (iii) Effective length of column. **(06 Marks)**

b. Calculate the safe buckling load on a hollow column of 200 mm external diameter and thickness 20 mm. The length of the column is 5 mts. Use Euler's formula with factor of safety = 4, $E = 2 \times 10^5 \text{ N/mm}^2$. When
(i) Both ends hinged. (ii) One end fixed and the other hinged. **(14 Marks)**

8 a. What are the assumptions made while deriving Euler's Buckling load formula? **(05 Marks)**

b. Determine the buckling load for a T-section column of flange width 100 mm and overall depth 80 mm. Thickness of both flange and stem 10 mm. The column is 4 mts long and hinged at both ends. Take $E = 2 \times 10^5 \text{ N/mm}^2$. **(15 Marks)**

9 a. A concrete column with square section 250mm × 250mm consists of '4' steel bars, each of diameter 16 mm. Determine the stresses induced in steel and concrete, when the column is subjected to a load of 300 KN. Take $E_S = 200$ GPa, $E_C = 14$ GPa. **(10 Marks)**

b. A square Reinforced axially loaded column is 300mm × 300mm. The effective length of column is 3 m. With '6' bars of 16 mm diameter. The grade of concrete is M_{20}. Determine the strength of column with steel grade Fe415. **(10 Marks)**

10 The cross section of a rectangular column is 250mm × 400mm with 8 vertical 16 mm dia bars. Determine the strength of column for the given stresses in steel and concrete,
(i) M_{20} and Fe415. (ii) M_{25} and Fe500 (iii) M_{15} and Fe250 **(20 Marks)**