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09ENG3.5

Third Semester B.Arch. Degree Examination, Dec.2018/Jan.2019
Structures – III

Time: 3 hrs. Max. Marks:100

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

1 a. Derive torsion equation with usual notations. **(08 Marks)**

b. Calculate the max.intensity of shear stress induced and the angle of twist produced in degrees in solid shaft of 100 mm diameter, 10 m long, transmitting 112.5 kW at 150 rpm. Take G = 82 KN/mm^2. **(12 Marks)**

2 a. State the assumptions made in theory of pure torsion. **(05 Marks)**

b. A shaft is required to transmit 245 kW power at 240 rpm. The maximum torque may be 1.5 times the mean torque. The shear stress in the shaft should not exceed 40 N/mm^2 and the twist one degree per meter length. Determine the required diameter if (i) Shaft is solid (ii) Shaft is hollow with external diameter twice the internal diameter. Take G = 80 kN/mm^2. **(15 Marks)**

3 a. Define : (i) Polar section modulus (ii) Torsional rigidity **(05 Marks)**

b. Prove that hollow shaft is stronger and stiffer than the solid shaft of same material, length and weight. **(15 Marks)**

4 a. Derive the Euler's formula for a column with both ends hinged. **(08 Marks)**

b. Determine the buckling load for a strut of T-section the flange width being 100 mm, overall depth 80 mm and both flange and stem 10 mm thick. The strut is 3 m long and is hinged at both ends. Take $E = 200 \times 10^3$ N/mm^2. **(12 Marks)**

5 a. Derive Rankine's formula for columns. **(08 Marks)**

b. A hollow cast from iron whose outside diameter is 200 mm and has a thickness of 20 mm is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.5. Find the ratio of Euler's load to Rankine's load.

Take $E = 1 \times 10^5$ N/mm^2 and Rankine's constant = $\frac{1}{1600}$ for both ends pinned case and $f_c = 550$ N/mm^2 **(12 Marks)**

6 a. Derive differential equation for deflection with usual notations. **(10 Marks)**

b. Find the displacement of free end of Cantilever beam shown in Fig. 6 (b). Take $E = 2 \times 10^5$ N/mm^2 and $I = 180 \times 10^6$ mm^4. **(10 Marks)**

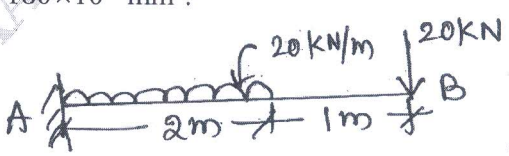

Fig. Q6 (b)

7 a. State and explain moment area theorems. **(10 Marks)**

b. Determine the slope and deflection at the free end of the Cantilever beam shown in Fig.Q7 (b) by moment area method. Take $E = 2 \times 10^8$ kN/m^2 and $I = 1.5 \times 10^{-4}$ m^4. **(10 Marks)**

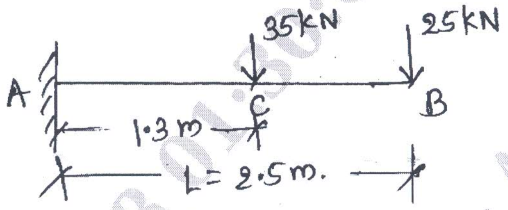

Fig. Q7 (b)

8 Determine deflection under each point load using Macaulay's method. Also find maximum deflection. Take $E = 210 \times 10^6$ kN/m^2, $I = 64 \times 10^{-4}$ m^4. Refer Fig. Q8. **(20 Marks)**

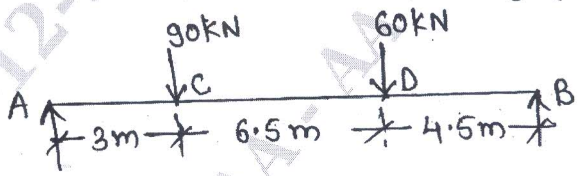

Fig. Q8

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