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09ENG3.5

Third Semester B.Arch. Degree Examination, Dec. 2013/Jan. 2014
Structures – III

Time: 3 hrs. Max. Marks:100

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

1 a. Derive the torsional equation with usual notations. **(06 Marks)**

b. Find the diameter of a solid circular shaft to transmit 6000 watts at 150 rpm for a maximum permissible shear stress of 60 MPa. Also find the angle of twist over a length of 2.5m. Take $G = 7.85 \times 10^4$ N-mm^2. **(14 Marks)**

2 a. Prove that a hollow shaft is stronger and stiffer than the solid shaft of same material, length and cross sectional area. **(10 Marks)**

b. What percentage of strength of a solid shaft 100 mm diameter is lost by boring 50 mm diameter axial hole in it? **(10 Marks)**

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3 a. Derive Euler's formula for crippling load of long columns with both ends hinged. **(08 Marks)**

b. Compare the load carrying capacity of a solid circular column with that of a hollow circular column of same cross sectional area. The internal diameter of hollow column is $3/4^{th}$ of the external diameter. The columns have the same length and are pinned at the ends. **(12 Marks)**

4 a. Derive Rankine's formula with usual notation. **(10 Marks)**

b. A solid round bar of 60 mm diameter and 2.5 m long is used as a column. Find the safe compressive load if i) Both ends fixed ii) Both ends hinged. Take $E = 2 \times 10^5$ N/mm^2. $F_S = 3$. **(10 Marks)**

5 a. Write Euler's crippling load for different end conditions of a column. **(05 Marks)**

b. What are the limitations of Euler's formula? **(05 Marks)**

c. Find the Euler's crippling load for a hollow cylindrical cast iron column of external diameter 150 mm and thickness 20 mm. The length of the column is $3/4^{th}$ of external diameter. The columns have the same length and are pinned at the ends. **(10 Marks)**

6 a. Derive the deflection equation $EI\frac{d^2y}{dx^2} = M_x$ with usual notations. **(08 Marks)**

b. Find the slope and deflection at the free end of a cantilever beam of span 'L' when loaded with uniformly distributed load of W kN/m over the entire span. Use double integration method. **(12 Marks)**

7 Determine the maximum deflection and deflection under the loads for a simply supported beam carrying two concentrated load of magnitudes 200 kN and 120 kN at distaxes 2 m and 5 m from left end. Span of the beam is 8 m. EI = 2.1×10^{15} N –mm^2. **(20 Marks)**

8 a. Using moment area method. calculate maximum slope and deflection in Fig. Q8(a). **(10 Marks)**

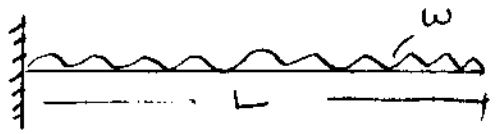

Fig. Q8(a)

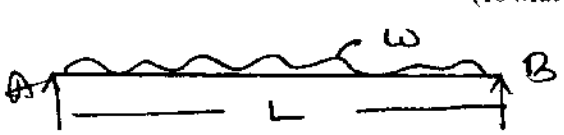

Fig. Q8(b)

b. Using moment area methods calculate maximum slope and deflection of Fig. Q8(b). **(10 Marks)**

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