43 (ARC-3) 3.5

2018

STRUCTURES–III

Paper : ENG–3.5

Full Marks : 100

Pass Marks : 40

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What is Double Integration Mehod for slope and deflection ? 5

   (b) A simply supported beam carries a uniformly distributed load over the whole span. Find the slopes at the supports and the maximum deflection. Sketch the elastic curve. 15

2. Write the assumptions of Pure bending theory and derive the Flexure Formula with neat sketches. 20

Contd.

3. *(a)* Draw the Torque diagram of the solid circular shaft having a fixed support as shown in *figure*-1.

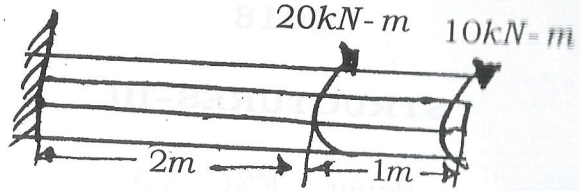

figure-1 5

(b) Write the basic assumptions in deriving the Torsion Formula and hence derive the Pure Torsion Formula. 15

4. *(a)* What are the benefits of using Rankine's Theory ? Find the critical stresses using Rankine's formulae for the struts with slenderness ratio 50. Assume that both the ends are hinged. $E = 200GPa$, Rankine's Constant = 1/7500, Yield stress = $300MPa$. 10

(b) Using Euler's theory, find the Critical Load P for the column having hinged-hinged supports and lenght L. 10

5. Write short notes on : 5×4=20

(a) Slenderness Ratio

(b) Macaulay's Method

(c) Buckling Load

(d) Polar moment of inertia.

6. *(a)* A solid circular shaft is subjected to a torque of $20kN\text{-}m$. If the maximum permissible shear stress is $50MPa$, find a suitable diameter for the shaft. 10

(b) A hollow circular shaft is of $180mm$ inner diameter and thickness $10mm$. Find the maximum stress if the torque is $12kN\text{-}m$. 10

7. Derive the general equations for slope and deflection along the length of the beam and find the slope and deflection at the free end. Consider the beam is a cantilver beam of span l, carrying an uniformly distributed load wkN/m having a constant EI.

Using the derived formulae at free-end, what is the slope and deflection for a cantilever beam of $4m$ span, E = 200 GPa, I = 30,000 cm^4 carrying udl of $10kN/m$. 15+5=20
