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09ENG3.5

**Third Semester B. Arch. Degree Examination, Dec.2017/Jan.2018**  
**Structures – III**

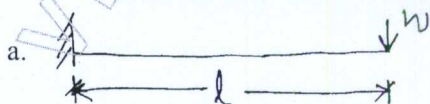
Time: 3 hrs.

Max. Marks:100

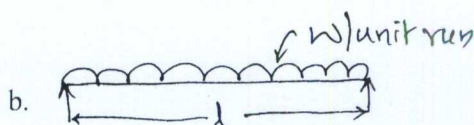
**Note: 1 Answer any FIVE questions.**

**2. Missing data, if any, may be suitable assumed.**

- 1 a. What are the assumptions made in the theory of pure torsion? (06 Marks)
- b. A solid circular steel shaft has to transmit 100 KW at 100 rpm. Allowable shear stress as  $70 \text{ N/mm}^2$ . Find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds the mean by 20%. (14 Marks)
- 2 a. Show that  $\frac{T}{J_p} = \frac{C\theta}{L}$  with usual notations. (06 Marks)
- b. A brass shaft is to transmit 200 kW power at 100 rpm with an diameter of 120mm and having an angle of twist of  $2^\circ$ . Find the suitable length for the shaft. Take  $C = 90 \times 10^3 \text{ MPa}$  (14 Marks)
- 3 a. Define polar modulus. Also give an expression for polar modulus for solid and hollow circular shaft. (06 Marks)
- b. Find the maximum shear stress induced in a solid circular shaft of diameter 150mm. When the shaft transmits 150KW power at 180rpm. (14 Marks)
- 4 a. What are the assumptions made in Euler's theory? For an axially loaded column. (06 Marks)
- b. For a solid round bar 3m long and 50mm diameter is used as shunt. Determine the crippling load  $E = 2 \times 10^5 \text{ N/mm}^2$  for : i) with both ends hinged ii) with fixed. (14 Marks)
- 5 a. Define slenderness ratio, factor of safety and Buckling factor. (06 Marks)
- b. The external and internal dia of hollow column are 50mm and 40mm respectively. if length of the column is 3m and both ends are fixed. Determine the crippling load using Rankin's formula Take  $\sigma_c = 550 \text{ N/mm}^2$  and  $\alpha = \frac{1}{1600}$  in Rankin's formula. (14 Marks)
- 6 a. Derive an expression for Rankin's formula with usual notations. (06 Marks)
- b. A column of timber section  $150 \text{ mm} \times 200 \text{ mm}$  is 6m long with both ends being fixed. If  $E = 17.5 \times 10^3 \text{ N/mm}^2$ , determine : i) crippling load ii) safe load for the column if  $f_s = 3.0$ . (14 Marks)
- 7 a. Derive an expression  $M = EI \cdot \frac{d^2y}{dt^2}$  with usual notations. (06 Marks)
- b. A wooden beam 150mm wide and 250mm deep has a span of 4m. Determine the load that can be placed at its centre to cause the beam a deflection of 12mm. Take  $E = 6 \times 10^6 \text{ kN/m}^2$ . (14 Marks)
- 8 Using moment area method calculate maximum slope and deflection for :



(10 Marks)



(10 Marks)

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