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09ENG3.5

# Third Semester B. Arch Degree Examination, June/July 2016

## Structure – III

Time: 3 hrs. Max. Marks: 100

**Note: 1.** ***Answer any FIVE full questions,***
**2.** ***Missing data may be suitably assumed.***



1 a. Show that $\frac{f_s}{R} = \frac{C\theta}{L}$ with usual notations. **(08 Marks)**

b. Find the diameter of a solid circular shaft to transmit 6000 watts @ 150rpm for a maximum permissible shear stress of 60MPa. Also find the angle of twist over a length of 2.50m C = $7.85 \times 10^4$MPa **(12 Marks)**

2 a. Show that $T = \frac{\pi}{16} f_s \cdot D^3$ for a solid circular shaft. **(08 Marks)**

b. Find the maximum shear stress induced in a solid circular shaft of diameter 150mm. When the shaft transmits 150kW power at 150 rpm. **(12 Marks)**

3 a. Define : i) Polar modulus ii) Torsional rigidity
iii) Torsional strength iv) Torsional flexibility. **(08 Marks)**

b. A solid shaft 80mm diameter is to be replaced by a hollow shaft of external diameter 100mm. Determine the internal diameter of hollow shaft if the same power is to be transmitted by both the shafts at the same angular velocity and shear stress. **(12 Marks)**

4 a. Enumerate the assumptions made in deriving torsion formula. **(08 Marks)**

b. A solid shaft of 60mm diameter is running at 150rpm. If the shear stress is not to exceed 50MPa. Find the power which can be transmitted by the shaft. **(12 Marks)**

5 a. State the assumptions made in Euler's column theory. **(08 Marks)**

b. Derive an expression for Euler's buckling load formula with both ends of the column are hinged. **(12 Marks)**

6 a. Derive an expression for Rankine's formula with usual notations. **(08 Marks)**

b. A column of timber section 150mm × 250mm is 6m long with both ends being fixed. IF E = $17.5 \times 10^3$ MPa for timber determine i) Crippling load ii) Safe load for the column if $F_s = 3.0$ **(12 Marks)**

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

b. A simply supported beam of length 4m, carries a udl of 40kN/m and a central point load of 70kN. Find the maximum deflection and slope the beam can carry. **(12 Marks)**

8 a. Derive an expression for maximum slope and deflection for a Cantilever beam with concentrated load at its free end using moment area method. **(08 Marks)**

b. A steel cantilever of span 2.5m carries a point load of W.kN at its free end. The moment of inertia of the section of the cantilever is $9900 \times 10^{-8}$ m$^4$. If the deflection of the beam at its free end is not to exceed 0.0075m, what must be the value of 'W' which the beam can carry? Take E = 210 GN/m$^2$. **(12 Marks)**

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