Third Semester B.Arch. Degree Examination, Dec.2016/Jan.2017
Structures – III

Time: 3 hrs.   Max. Marks:100

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

1 a. State the assumptions made in theory of pure torsion.   **(06 Marks)**
   b. Find the maximum shear stress induced in a solid circular shaft of dia 150mm, when the shaft transmits 150kN power at 180rpm.   **(14 Marks)**

2 a. With usual notations show that $\dfrac{J}{R} = \dfrac{C\theta}{L}$.   **(06 Marks)**
   b. A solid steel shaft has to transmit 100kW at 160 rpm. Taking available shear stress as 70 N/mm^2, find the suitable diameter of the shaft. The maximum torque transmitted in each resolution exceeds the mean by 20%.   **(14 Marks)**

3 a. Define polar modulus torsional rigidity and torsional strength.   **(06 Marks)**
   b. Find the maximum torque that can be safely applied for a shaft of diameter 80mm of length 5m bears angle of twist 1.5°. The shaft produces a shear stress of 42 N/mm^2. Take C = 84 GPa.   **(14 Marks)**

4 a. What are the assumptions made in the Euler's theory, for an axially loaded column?   **(06 Marks)**
   b. A solid sand bar of 3m long and 50mm in diameter is used as a strut with four end conditions. Determine the crippling load for each condition E = 2 × 10^5 N/mm^2.   **(14 Marks)**
      i)   Both ends hinged.
      ii) One and fixed other free.
      iii) Both ends fixed.
      iv) One end fixed other hinged.

5 a. Derive Euler's formula for crippling load of long column with both ends hinged.   **(06 Marks)**
   b. A column of timber section 150mm × 200mm is 6m long with both ends fixed if E = 17.5 kN/mm^2. Determine: i) Crippling load; ii) Safe load when FS = 3.   **(14 Marks)**

6 a. A steel cantilever of span 2.5m carries a point load of WkN at its free end. The moment of inertia of the section is 9900 × 10^{-8}m^4. If the detection at the free end is not to exceed 0.75cm. What must be the value of W? E = 210 GN/m^2.   **(10 Marks)**
   b. A steel cantilever projecting 3m from wall is loaded with a udl 20 kN/m run. Find the slope and deflection of the beam if the MI of the beam section is 7550 × 10^{-8}m^4.   **(10 Marks)**

7 A timber beam of rectangular section 10cm × 25cm is simply supported over a span of 4m. What udl is kN/m should the beam carry to produce a central deflection of 0.6cm? Calculate slope also.   **(20 Marks)**

8 Determine the maximum slope and deflection for,
   i)   Cantilever beam with a concentrated load at the free end.
   ii) Simply supported beam with udl through out.
   Use moment area method.   **(20 Marks)**

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