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09ENG3.5

Third Semester B.Arch. Degree Examination, June/July 2017
Structures – III

Time: 3 hrs. Max. Marks:100

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

1 a. State the assumptions made in deriving the torque equation. **(06 Marks)**

b. With usual notations, derive the torque equation. **(14 Marks)**

2 a. A hollow shaft is to transmit 337.5 KW at 100 rpm. If the shear stress is limited to 65 N/mm^2 and the internal dia is 0.6 of the external diameter, find the dia assuming that the max torque is likely to exceed the mean by 30%. **(10 Marks)**

b. Determine the dia of a solid circular shaft which will transmit 112.5 KW at 200 rpm. Also determine the length of the shaft if the twist is not to exceed 1.5° over the entire length of shaft. The max shear stress is limited to 55 N/mm^2 and C = 0.8×10^5 N/mm^2. **(10 Marks)**

3 a. An axial hole of 8 mm radius is bored out from a 28 mm dia solid circular shaft. What percentage of torsional strength is lost by this operation? **(10 Marks)**

b. Calculate the safe compressive load on a hollow cast iron column of 100 mm external dia and 70 mm internal dia and 8000 mm in length. One end of column is fixed and other is hinged. E = 95 KN/mm^2 FOS = 4. Use Euler's formula. **(10 Marks)**

4 a. Define "Effective length", "Slenderness ratio" and "Critical load" with reference to columns. **(06 Marks)**

b. A hollow castiron rectangular column has external dimensions 150×200mm and wall thickness 25 mm. The height of the column is 5 mt with fixed ends. Compute the critical load on the column by Euler's formula and Rankine's formula. $f_c = 500$ N/mm^2, $E = 120\times10^3$ N/mm^2, $a = \frac{1}{1600}$. **(14 Marks)**

5 a. Determine the critical load given by Euler's and Rankine's formula for a tubular steel strut 2300 mm long having outer and inner dia 38 mm and 33 mm respectively, loaded through hinged ends. $f_c = 335$ N/mm^2, $a = \frac{1}{7500}$, $E = 2\times10^5$ N/mm^2.

For what length of this strut does Euler's formula cease to apply? **(12 Marks)**

b. A column of timber section 100×150mm is 5000 mm long with both ends fixed. If the modulus of elasticity for timber is 17.5 kN/mm^2. Determine the crippling load and also safe load on the column, using Euler's formula FOS = 3 **(08 Marks)**

6 a. By double integration method, calculate the slope at the supports and max deflection for a simply supported beam of span L carrying a udl throught its span. **(12 Marks)**

b. By double integration method, calculate the max slope and deflection for a Cantilever beam of span L carrying point load P at its free end. **(08 Marks)**

7 Calculate the slope at the supports and deflection under the loads for a simply supported beam of span 5 mt, carry point load 50 KN at 1 mt and 100 KN at 3 mt from left support. Use Macaualay's method. EI = 60000 KN/m^2 **(20 Marks)**

8 a. State moment area theorems for slope and deflection of beams. **(08 Marks)**

b. Calculate the slope at the supports and deflection at mid span for a simply supported beam of span 6 mt carrying a udl of 20 KN/m over its entire span. $EI = 10000\,KN/m^2$. Adopt moment –area method. **(12 Marks)**

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