



## II B.Tech II Sem Regular End Examination, August 2021

**STRENGTH OF MATERIALS – II****(CIVIL)****Time: 3 Hours.****Max. Marks: 70**

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

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|---|----|---|----|-----|-----|
| 1 | a) | A solid circular steel shaft is transmitting 200 horse power at 300 rpm. Determine the diameter of the shaft if the maximum shear stress is not to exceed $80\text{N/mm}^2$ and angular twist per meter length of the shaft is not to exceed $1^\circ$ .                              | 7M | CO1 | BL4 |
|   | b) | An open coiled helical spring made from wire of circular cross-section is required to carry a load of 110 N. The wire diameter is 8mm and mean coil radius is 48 mm. If the helix angle of the spring is $30^\circ$ and the number of turns is 12, Calculate:                         | 7M | CO1 | BL4 |
|   |    | i) Axial deflection   |    |     |     |
|   |    | ii) Angular rotation of free end with respect to the fixed end of the spring.   |    |     |     |
| 2 | a) | Deduce the simple torsion equation of a circular shafts   | 7M | CO1 | BL3 |
|   | b) | An open coil helical spring made of 10 mm wire and mean dia 100mm has 12 No. of coils, angle of helix being $15^\circ$ . Determine the axial deflection and the intensities of bending and shear stress under a load of 500 N. Take $C=80\text{ GPa}$ ; $E=200\text{ GPa}$            | 7M | CO1 | BL4 |
| 3 | a) | Derive secant and Perry's formula for a column  | 7M | CO2 | BL4 |
|   | b) | A steel strut, 1 m long , is 30 mm in diameter. It is subjected to an axial thrust of 18 kN. In addition, a lateral load W acts at the centre of the strut. If the strut fails at a maximum stress of $350\text{ MN/m}^2$ , determine the magnitude of W. Take $E= 210\text{ GN/m}^2$ | 7M | CO2 | BL4 |
| 4 | a) | From fundamentals, derive an expression for Euler's critical load for a column with one end fixed and other end hinged. State the assumptions made in the derivation.   | 7M | CO2 | BL4 |
|   | b) | Explain determination of stresses in the case of chimney.   | 7M | CO3 | BL3 |
| 5 | a) | Discuss briefly the stresses in beams subjected to unsymmetrical bending.   | 7M | CO3 | BL3 |
|   | b) | A rectangle strut 20 cm wide and 15 cm thick it carries a load of 60 KN at an eccentricity of 2cm in a plane bisecting the thickness. Find the maximum and minimum stress intensities at that section.  | 7M | CO3 | BL4 |

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|---|----|--|----|-----|-----|
| 6 | a) | Calculate change in diameter, change in length and change in volume of a thin cylindrical shell 100cm diameter, 1cm thickness and 5m long when subjected to internal pressure of $3\text{N/mm}^2$ , take the value of $E = 2 \times 10^5 \text{ N/mm}^2$ and poisson's ratio $\mu = 0.3$   | 7M | CO4 | BL4 |
|   | b) | Write in detail about the assumptions of thin cylinders.   | 7M | CO4 | BL3 |
| 7 | a) | Calculate the thickness of the metal necessary for a steel cylinder shell of internal diameter 0.15 m to withstand an internal pressure of 50 $\text{MN/m}^2$ ; the maximum permissible tensile stress is not to exceed 150 $\text{MN/m}^2$  | 7M | CO4 | BL3 |
|   | b) | Show that the product of inertia of a T section about a centroidal axis is zero.   | 7M | CO5 | BL4 |
| 8 | a) | Determine the stresses and deflection at the midpoint of a channel section by unsymmetrical method. Also identify the position of the neutral axis.  | 7M | CO5 | BL4 |
|   | b) | A cantilever 2.8 m long having T section with flange 12 cm x 2 cm and web 13 cm x 2 cm carries a concentrated load W its free end but inclined at an angle of $45^\circ$ to the vertical. Determine the maximum value of W if the deflection at the free end is not to exceed 2 mm. assume $E = 200 \times 10^3 \text{ N/mm}^2$ . What is the direction of neutral axis with respect to the vertical axis. | 7M | CO5 | BL4 |

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