Code No: 154CA **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, March - 2022
STRENGTH OF MATERIALS – II
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Derive the equation of torsion from fundamentals.
b) Find the power that can be transmitted by a 60mm diameter shaft at 160rpm, if the permissible shear stress is 80N/mm^2 and the maximum torque 30% greater than the mean torque. [7+8]

2.a) A steel close coiled helical spring is subjected to an axial couple of 60kN-mm. The mean coil diameter of the spring is 75mm and the diameter of the spring wire is 8mm. if the number of coils of the spring is 15, find the bending stress induced in the wire and the increase in the number of turns.
b) For a close-coiled helical spring subjected to an axial load of 300N having 12 coils of wire diameter of 16mm, and made with coil diameter of 250mm, find: (i) axial deflection, (ii) strain energy stored, (iii) maximum torsional shear stress in the wire. Take modulus of rigidity as 80GN/m^2. [7+8]

3. Derive an expression for Euler's critical load of a column with one end fixed and the other end hinged from the first principles. [15]

4.a) Determine the section of a cast iron hollow cylindrical column 3m long with both ends fixed, if it carries an axial load of 800kN. The ratio of internal to external diameter of the column is 5/8. Use Rankine's formula by taking Rankine's constant as 1/1600 and working crushing strength of material as 550N/mm^2.
b) Explain in brief about Prof. PREYY'S formula. [10+5]

5.a) Distinguish between Direct stress and Bending stress by means of diagram.
b) A column is rectangular in cross section 400 × 500 mm. The column carries an eccentric loading of 460kN on one diagonal at a distance of quarter diagonal length from a corner. Calculate the stresses at all four corners. Also draw stress distribution diagram for any side. [5+10]

6. A square chimney, 30 m high, has a flue opening of size 1.5 m×1.5 m. Find the minimum width required at the base for no tension if the masonry weights 20 kN/m^3 and the wind pressure is 1.5kN/m^2. The permissible stress in the masonry is 1kN/m^2. [15]

7. A thin steel cylindrical shell of thickness 10mm, 1.5mm diameter and 4.5m long is carrying a fluid at a pressure of 3.5N/mm^2. Find the change in diameter, length and volume of the cylinder. Assume E = 2×10^5 N/mm^2 and Poisson's ratio = 0.25. [15]

8. A simply supported beam of span 4.5m has with I cross-section of size, 150mm × 250mm × 10mm. The beam is subjected to a concentrated load of 125kN at the mid-span in a plane making an angle 30^0 with respect to vertical and passing through the centroid of the section. Determine the maximum stress developed in the section. [15]

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