Code No: 154CA **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, August/September - 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 solid circular shaft is subjected to a bending moment 60 kN-m and a torque of 25 kN-m. Design the shaft according to maximum shear stress theory and maximum distortion theory. Adopt the stress at elastic limit as 250 N/mm ^{2}, Poisson's ratio is 0.3 and the factor of safety is 2. [15]

2.a) A closed coil helical spring of round steel wire 10mm in diameter has a mean radius of 120 mm. The spring has 10 complete turns and is subjected to a axial load of 200 N. Determine: i) deflection of the spring ii) Maximum shear stress in the wire iii) stiffness of the spring. G = 80 kN/mm^2.

b) A close coiled helical spring is to carry a load of 950 N. Its mean coil diameter is 10 times that of wire diameter. Calculate the diameter of coil and wire if the shear stress in the material of the spring is 80 kN/mm^2. [10+5]

3.a) Explain the assumptions made in Euler's column theory. How far are assumptions valid in practice?

b) Define the slenderness ratio. State the limitations of the Euler's formula. [7+8]

4. Derive an expression for Rankine's crippling load for a column, from first principles. [15]

5.a) A hollow rectangular column of external depth 1 m and external width 1 m is 10 cm thick. Calculate the maximum and minimum stress in the section of the column, if vertical load of 200 kN is acting with an eccentricity of 20 cm.

b) A short column of external diameter 40 cm and internal diameter 20 cm carries an eccentric load of 80 kN. Find the greatest eccentricity the column can have without producing tension on the cross-section. [9+6]

6.a) Determine the stresses in case of the retaining wall with suitable example.

b) Find the resultant stress when a column of rectangular section is subjected to a load which is eccentric both sides. [9+6]

7. A thick cylinder of inner radius 150mm and outer radius 210 mm is subjected to internal pressure 'p' such that the maximum hoop stress developed in cylinder is 155 MPa. Draw the hoop stress and radial stress distribution along the thickness of cylinder. If E = 200 GPa, what is the circumferential strain in cylinder at the outer surface? Take Poisson's ratio = 0.3. [15]

8.a) How will you find out the resultant stress in unsymmetrical bending?

b) A beam of rectangular section 80 mm wide and 120mm deep is subjected to a bending moment of 120 kN-m. The plane of loading is inclined at 45^0 to the y-y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section. [5+10]

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