Code No: R2022012 **R20** **SET - 1**

II B. Tech II Semester Supplementary Examinations, December - 2023

STRENGTH OF MATERIALS - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks

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UNIT – I

1 A plane element is subjected to stresses as shown in Fig.1. Determine the Principal stresses, maximum shear stress and their planes. Use Mohr's Circle Method. [14M]

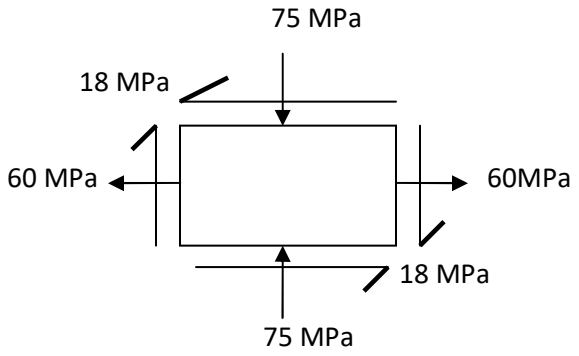

Fig.1

OR

2 A solid circular shaft is subjected to a bending moment of 66 kNm and a torque of 34 kNm. Design the diameter of the shaft according to: [14M]
i) The Maximum Principal Stress Theory
ii) The Maximum Shear Stress Theory and
iii) The Maximum Distortion Energy Theory.
Take Poisson's ratio = 0.29, the stress at elastic limit of the material is 275 MPa and the factor of safety=3.0.

UNIT – II

3 a) What is meant by 'Pure Torsion'? [2M]

b) A hollow shaft of diameter ratio 3/8 is to transmit 395 kW at 110 rpm. The maximum torque being 28 % greater than the mean, the shear stress is not to exceed 65 MPa and the twist in a length of 6 m is not to exceed 2 degrees. Calculate its external and internal diameters which would satisfy both the above said conditions. Take $G=9.2\times10^4$ MPa. [12M]

OR

4 An Open Coiled spring made from steel wire of circular cross-section is to carry a load of 140 kN. The wire diameter id 8 mm and the mean coil radius is 50 mm. Calculate (a) the axial deflection, (b) the angular rotation of the free end with respect to the fixed end. The helix angle of the spring is 34° and the number of turns is 16. Assume G=82 kN/mm^2 and E=206 kN/mm^2. [14M]

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UNIT – III

5 A hollow cast-iron column whose outside diameter is 300 mm and has a thickness of 20 mm is 5.3 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.8. Find the ratio of Euler's to Rankine's loads. Take $E_{cast\ iron}$ = 106 GPa and Rankine's constant = 1/1670 for both ends pinned case and the crushing strength of the material as 565 MPa. [14M]

OR

6 A hollow short column of external and internal diameters of 460 mm and 220 mm respectively carries an eccentric load of 100 kN. If the eccentricity of the load is 40 mm, find: (a) the maximum and minimum stress intensities, and (b) eccentricity upto which there will be no tension in the column. [14M]

UNIT – IV

7 A cylindrical chimney, 25 m high, of uniform circular section has 5 m external diameter and 3 m internal diameter. The intensity of horizontal wind pressure is 1.5 kN/m^2. Find the maximum and minimum normal stress intensities at the section. Density of masonry is 20 kN/m^3. [14M]

OR

8 A masonry retaining wall of trapezoidal section is 12 m high and retains earth which is level upto to the top. The width at top is 3m and at bottom is 9 m and the exposed face is vertical. Find the maximum and minimum intensities of normal stress at the base. [14]M

UNIT – V

9 A beam of rectangular section 230 mm wide and 360 mm deep is used over a simply supported span of 6.3 m to support two concentrated loads of 7 kN each at 2 m from either support. The plane of loads makes an angle of 36º with the vertical plane of symmetry. Find the direction of the neutral axis and the maximum bending stresses in the beam. [14M]

OR

10 a) Derive the formula to find shear centre for a symmetrical channel section, from first principles. [7M]

b) Find the approximate location of shear centre for a symmetrical channel section having overall depth of 320 mm. Thickness of web and flanges is 20 mm. [7M]