Code No: 19CET401 **R19**

II B. TECH II SEMESTER REGULAR EXAMINATIONS, AUGUST 2021
STRENGTH OF MATERIALS - II
(Civil Engineering)

Time: 3 hours Max. Marks: 60

Note: Answer **ONE** question from each Unit (**5 × 12 = 60 Marks**)

UNIT - I

1. a) An element in plane stress is subjected to stresses as shown in Fig-1. Determine (i) The magnitude of the principal stresses (ii) Find the orientation of principal planes and sketch the principal stresses on a properly oriented element. [6M]

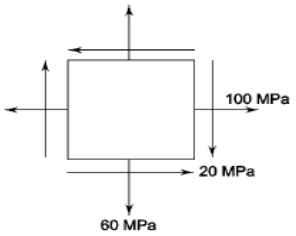

Fig-1

b) The load on a bolt consists of an axial pull of 15kN together with a transverse shear of 7.5kN. Determine the diameter of the bolt according to (i) Maximum principal stress theory (ii) Maximum strain theory. Elastic limit in tension is 285 N/mm^2 and a factor of safety of 3 is applied. Poisson's ratio = 0.3. [6M]

(OR)

2. a) An element in plane stress is subjected to stresses 60N/mm^2 tension, 40N/mm^2 compression and 30N/mm^2 shear. Determine the stresses acting on an element rotated by an angle 60^0 in a counterclockwise direction. Sketch the orientation of stresses. [6M]

b) A mild steel shaft 120mm diameter is subjected to a maximum torque of 20kNm and a maximum bending moment of 12kNm at a particular section. Find the factor of safety according to the maximum shear stress theory if the elastic limit in simple tension is 220MN/m^2. [6M]

UNIT – II

3. a) Determine the slope and deflection at the free end of the cantilever beam of span 2 m loaded as shown in Fig-2. [6M]

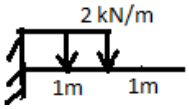

Fig-2

b) Find the maximum slope and deflection using differential equation approach for a cantilever beam having central point load. [6M]

(OR)

4. a) Mention any two relative merits of Moment area and Double Integration methods? [4M]

b) Use Macaulay's method and determine the deflection at center of a simply supported beam having U.D.L. throughout the span. [8M]

UNIT – III

5. a) A rectangular column of wood, 3 m long with a cross section of 200 mm x 150 mm. Determine the load carrying capacity of the column. Take E = 12.5GPa. Assume the column is fixed at both ends. [4M]

   b) Derive the expression for Euler's crippling load for a column when one end fixed and the other end is free. [8M]

(OR)

6. a) Discuss the assumptions and limitations of Euler's theory. [6M]

   b) A solid round bar 50 mm in diameter and 2.5 m long is used as a strut. Both ends of the strut are fixed. Find the safe compressive load, for this strut, using Euler's formula. Assume E = 200GN/m^2 and factor of safety = 3. [6M]

UNIT –IV

7. a) Prove that the limit of eccentricity is less than one sixth of its dimensions for a rectangular section. [4M]

   b) A short column of rectangular section 200mm x 300mm carries a compressive load of 800kN. The load is applied at a point (-50, 100) considering the centroid of the section as origin. Find the stresses at the four corners of the section. [8M]

(OR)

8. a) Sketch the core of Circular section and Hollow Circular sections. [4M

   b) A masonry dam, trapezoidal in cross section 4m high, 1m wide at its top and 3m wide at its bottom, retains water on its vertical face to a maximum height of 3.5m from its base. Determine the maximum stress at the base when the reservoir is full. Take the unit weight of masonry as 19.62kN/m^3. [8M]

UNIT –V

9. a) Define the shear centre. Diagrammatically represent the location of shear centre for symmetrical rectangular and I sections. [4M]

   b) A beam of T-section (flange: 60mm × 10mm, web 100mm × 5mm) is 3 m length and is simply supported at the ends. It carries a load of 4kN inclined at 20^0 to the vertical and passing through the centroid of section. If E = 200GN/m^2, calculate the maximum tensile stress [8M]

(OR)

10. a) A L-section beam (flange: 200mm × 20mm, stem 180mm × 20mm) is 3m length and is simply supported at the ends. It carries a load of 0.2kN inclined at 30^0 to the vertical and passing through centroid of section. If E = 200GN/m^2, calculate the stresses at any two extreme/edge points. [6M]

    b) Determine the location for the shear center of a symmetrical channel section of top and bottom width as 'b' total height 'h' and thickness as 't'mm. [6M]

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