Code No: **20CE5P01**

R20

III B. TECH I SEMESTER REGULAR EXAMINATIONS, NOVEMBER - 2022
ADVANCED STRENGTH OF MATERIALS
(Civil Engineering)

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

Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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UNIT-I

1. a) Define and explain the maximum principal stress theory. [7M]

   b) At a point in a material, the stresses on two mutually perpendicular planes are 80N/mm^2 (tensile) and 40 N/mm^2 (tensile). The shear stress across these planes is 60N/mm^2. Find magnitude and direction of the resultant stress on a plane making an angle of 45^{0}with the plane of the first stress. Find also, the normal and tangential stresses on this plane. [7M]

(OR)

2. a) Define and explain the maximum principal strain theory. [7M]

   b) The stresses at a point in a bar are 200N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of the major stress Also determine the maximum intensity of shear stress in the material at the point. [7M]

UNIT-II

3. a) State the assumptions made in Euler's theory and also write the limitations. [7M]

   b) Find the shortest length L for pin ended steel column having a cross section of 60mmx100mm for which Euler's formula applies. Take E_s=2x10^5 N/mm^2 and critical proportional limit is 250N/mm^2. [7M]

(OR)

4. a) What do you mean by end conditions of a column? Write effective length of column for various end conditions. [7M]

   b) Find Euler's critical load for a hollow cylindrical cast iron column 200mm external diameter and 25mm thick, if it is 6m long and hinged at both ends. Take E=8x104 N/mm^2. [7M]

   Compare Euler's Critical load with the Rankine's critical load taking fc=550N/mm^2 and α=1/1600.

UNIT-III

5. a) Explain the conditions for stability of dam. [7M]
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b) A masonry chimney 18m high is of circular section, the external and internal diameters of the section being 6m and 3m respectively. The chimney is subjected to a horizontal wind pressure of 1500N/m^2 of the projected area. Find the maximum and minimum stress intensities at the base. Take the weight of masonry as 21kN/m^3. [7M]

(OR)

6. a) Explain the following terms [7M]
   i. Core or kernel of a section
   ii. Limit of eccentricity

   b) A Retaining wall 2m wide at top and 8m wide at bottom and 10m high is subjected to earth pressure on the back. If the weight of masonry is 25kN/m^3, and weight of earth retained is16kN/m^3 and angle of repose is 30^0 is horizontal and level with the top of the wall, Find maximum and minimum stress intensities at the base. Examine the stability of the wall if μ=0.62. [7M]

UNIT-IV

7. a) Explain the stresses induced due to unsymmetrical bending. [8M]

   b) Define principal axes and principal moment of inertia. [6M]

(OR)

8. a) Define shear centre. Write the shear centre equation for unsymmetrical I section. [7M]

   b) A channel Section has flanges 12 cm x 2 cm and web 16 cm x 1 cm. Determine the shear centre of the channel. [7M]

UNIT-V

9. a) What is mean by Circumferential stress (or hoop stress) and Longitudinal stress? Derive an expression for the longitudinal stress in a thin cylinder subjected to an uniform internal fluid pressure. [7M]

   b) The air vessel of a torpedo is 100cm external diameter and 1cm thick, the length being 5000mm.Find the change in the external diameter and length when changed to 3 N/mm^2 internal pressure. Take E=2.1x10^5 N/mm^2 and poisons ratio=0.3. [7M]

(OR)

10. a) What do you mean by Lame's equations? How will you derive these equations? [7M]

    b) A pipe of 200mm internal diameter and 100mm thickness contains a fluid at a pressure of 6 N/mm^2.Find the maximum and the minimum hoop stress across the section. [7M]

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