SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E - CIVIL
Title of the paper: Mechanics of Solids - II
Semester: IV Max. Marks: 80
Sub.Code: 6C0082 Time: 3 Hours
Date: 17-11-2008 Session: AN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Draw the conjugate beam for a simply supported beam of span (I) subjected to a point load (P) at the mid-span.

2. Give the slope and deflection boundary conditions in a cantilever beam.

3. Define the radius of gyration.

4. Differentiate long column from short column.

5. Write the stress components in a thin cylindrical shell subjected to internal pressure.

6. Give the Lame's equations to solve thick cylinder problems.

7. Write the expression for maximum shear stress for a state of stress having $\sigma_X \sigma_Y$ and T_{XY}.

8. List any four theories of failure.

9. Define shear centre.

10. Determine the moments of inertia of a rectangle of size 10mm x 6mm.

PART – B (5 x 12 = 60)

Answer All the Questions

11. A simply supported beam of span 6m is subjected to two concentrated loads of 10kN and 20kN at 2m and 4m respectively from left support. Determine the maximum deflection by Macaulay's method. Assume flexural rigidity is constant.

(or)

12. A cantilever beam of span 5m is subjected to a udl of 2kN/m over a length of 3m from the fixed end. Calculate the slope and deflection at the free end by Conjugate beam method. Assume flexural rigidity is constant.

13. A column of height 8m is fixed at both ends. The cross section of the column is 300 x 200mm. Calculate the slenderness ratio that will govern the buckling. Also find the buckling load. Take E = 210 GPa.

(or)

14. A steel bar of solid circular cross section is 50mm diameter. The bar is pinned at each end and subject to axial compression. If the proportional limit of the material is 210MPa and E = 210GPa, determine the minimum length for which Euler's formula is valid. Also determine the value of the buckling load if the column has this minimum length.

15. A thin cylinder of 80mm outer diameter and 72mm inner diameter is subjected to an internal pressure of 0.1 MPa. Determine the longitudinal and hoop stresses. If the maximum hoop stress is limited to 17.5MPa, find the thickness of the cylinder.

(or)

16. A pipe of 150mm internal diameter and 200mm external diameter fails under hoop tension for an internal pressure of 50MPa. Determine, for a safety factor of 4, the safe internal pressure for a

second pipe of the same material and internal diameter but with 40mm thick wall.

17. An element in plane stress at the surface of a large machine is subjected to stresses σ_X = 15MPa, σ_Y = 5MPa and T_{XY} = 4MPa Mohr's circle, determine the principal stress and maximum shear stress.

(or)

18. Estimate the torque on a 10mm diameter steel shaft when yielding begins using
(a) Tresca theory,
(b) von Mises theory.
The yield strength of the steel is 140 MPa.

19. An unequal angle section of uniform thickness 5mm has leg of lengths 60mm and 40mm. Estimate the moment of inertia about both the axes and also product of inertia.

(or)

20. Locate the shear centre for the section shown in figure.