Reg. No. _____

Karunya University

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – November / December 2009

Subject Title: MECHANICS OF SOLIDS **Time : 3 hours**
Subject Code: CE203 **Maximum Marks: 100**

Answer ALL questions
PART – A (10 x 1 = 10 MARKS)

1. Define factor of safety.
2. Express bulk modulus in terms of Young's modulus and Poisson's ratio.
3. What is the relation between applied distributed load and shear force on a beam?
4. The maximum bending moment of a simply supported beam of length L subjected to a u.d.l. q_o is _____.
5. Write the assumptions in simple bending theory.
6. What is the difference between open coiled spring and close coiled spring?
7. What is the angle between principal axis and the direction corresponding to maximum shear stress?
8. If σ_{xx} = 4 N/mm^2, σ_{yy} = 6 N/mm^2 and τ_{xy} = 2 N/mm^2, then the major principal stress is _____.
9. Write the first statement of moment area method.
10. What is Rankine's formula for columns?

PART – B (5 x 3 = 15 MARKS)

11. Derive the expression for strain energy due to axial load.
12. Draw the shear force and bending moment diagrams for a simply supported beam subjected to central concentrated load P.
13. Find the ratio of torsional rigidities of a solid shaft and hollow shaft of equal area. The internal radius of hollow shaft is the same as the radius of the solid shaft.
14. Find the maximum shear stress and principal direction for σ_{xx} = 5 N/mm^2, σ_{yy} = 3 N/mm^2 and τ_{xy} = 2 N/mm^2.
15. What is buckling? Explain.

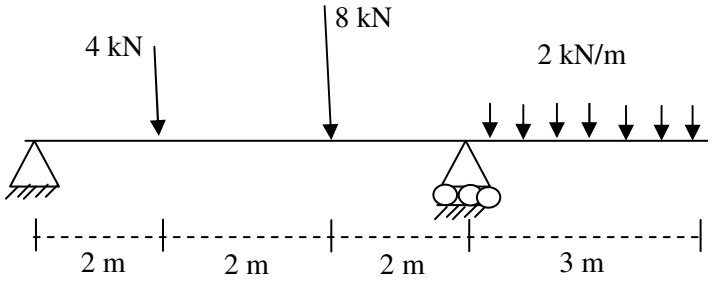
PART – C (5 x 15 = 75 MARKS)

16. A bar of varying cross section is hung from a ceiling. Its circular cross section varies in diameter from d_1 at top to d_2 at bottom linearly. Find the elongation due to self weight mass density = ρ and Young's modulus = E, Length = L.

(OR)

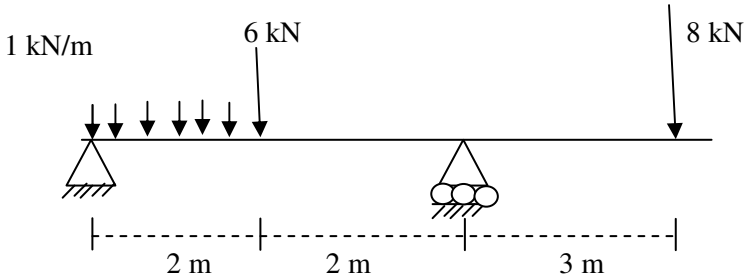
17. A cylindrical shell (thin) of length 1 m is having radius 0.5 m and thickness 1 cm is subjected to an internal pressure 10 kN/m^2. If Young's modulus = 2 x 10^5 N/mm^2, find the change in diameter, change in length and change in volume of the cylinder.

18. Draw the shear force and bending moment diagram for the following beam.



(OR)

19. Find the location and magnitude of maximum bending moment and points of contraflexure for the following beam.



20. A tee section of width 100 mm, overall depth 100 mm and uniform thickness 20 mm is used as a cantilever of span 1 m. If it carries of 5 kN load at the free end, what additional u.d.l. can be applied on it if bending stress is not to exceed 120 N/mm^2.

(OR)

21. A close coiled helical spring has a mean diameter of coil 120 mm and stiffness of the spring is 30 kN/m.
    a. Find the required diameter if the number of coils = 15.
    b. Find the number of coils, if the wire diameter is 10 mm. Take G = 80 GN/m^2.

22. At a point in a body, the normal and shear stress on a plane through the point are 80 MN/m^2 and 40 MN/m^2 respectively. The normal stress on a plane inclined to the former at 30^o clockwise is 31 MN/m^2, but shear stress on it is unknown. Find the principal stress and the maximum shear stress and locate their planes.

(OR)

23. At a point in a body, the normal and shear stresses on two mutually perpendicular forces and σ_{xx} = 70 MPa, σ_{yy} = 50 MPa, τ_{xy} = 40 MPa. Find the principal stresses and principal planes. Find also the stress on a plane at 60^o to x axis. Draw sketch for each result.

24. A simply supported beam is subjected to u.d.l. over half the span. Find the location and magnitude of maximum deflection. Flexural rigidity is constant.

(OR)

25. Find the Euler Buckling load for
    a. a fixed-fixed column.
    b. a simply supported column.