Karunya University

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

End Semester Examination – May / June 2009

Subject Title:MECHANICS OF SOLIDSSubject Code:CE203

Time : 3 hours Maximum Marks: 100

<u>Answer ALL questions</u> <u>PART – A (10 x 1 = 10 MARKS)</u>

- 1. Define Hook's Law.
- 2. Define Poisson's ratio.
- 3. What is a cantilever beam?
- 4. Define point of contraflexure.
- 5. Write any assumption made in theory of simple bending.
- 6. Define torsion.
- 7. What is a principal plane?
- 8. What is principal stress?
- 9. What is the critical load value for a column with both ends fixed?
- 10. Write the assumption made in Euler's theory.

$\underline{PART - B} (5 \times 3 = 15 \text{ MARKS})$

- 11. Find the minimum diameter of a steel wire, which is used to raise a load of 4000N if the stress in the rod is not to exceed 95MN/m².
- 12. Draw the shear force diagram for a cantilever beam of length "l" and subjected to UDL of w/m through out the length.
- 13. A rectangular beam 200mm deep and 300mm wide is simply supported over a span of 8m. What uniformly distributed load per metre the beam may carry if the bending stress is not to exceed 120 N/mm².
- 14. A rectangular of cross sectional area 10000mm^2 is subjected to an axial load of 20kN. Determine the normal stresses on a section, which is inclined at an angle of 30° with normal cross section of the bar.
- 15. A beam 4m long simply supported at its ends, carries a point load W at its center. If the slope at the ends of the beam is not to exceed 1°, find the deflection at the center of the beam.

<u>PART – C (5 x 15 = 75 MARKS)</u>

16. Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30mm and of length 1.5m if the longitudinal stain in a bar during a tensile stress is four times the lateral strain. Find the change in volume when the bar is subjected to a hydrostatic pressure of $100N/mm^2$. Take $E=1x10^5N/mm^2$.

(OR)

- 17. A vertical bar fixed at the upper end of uniform strength carries an axial tensile load of 600kN. The bar is 20m long and having weight per unit volume as 0.00008N/mm³. If the area of the bar at the lower end is 400mm², find the area of the bar at the upper end.
- 18. A simply supported beam of length 6m carries point load of 3kN and 6kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagram.

- 19. Draw the shear force and bending moment diagram of a simply supported beam of length 'l' and subjected to a point load of 'w' at a distance of 'a' from the left end and 'b' from the right end.
- 20. The stiffness of a close coiled helical spring is 1.5N/mm of compression under a maximum load of 60N.The maximum shearing stress produced in the wire of the spring is $125N/mm^2$.The solid length of the spring is given as 5cm.Find a. Diameter of the wire b. mean diameter of the coils c. number of coils required. Take C=4.5x10⁴N/mm².

(OR)

- 21. A solid circular shaft of 10cm diameter of length 4m is transmitting 112.5kW power at 150r.p.m. Determine the maximum shear stress induced in the shaft and strain energy in the shaft. Take $C=8x10^4$ N/mm².
- 22. The tensile stresses at a point across two mutually perpendicular planes are 120 N/mm² and 60 N/mm². Determine the normal, tangential and resultant stresses on a plane inclined at 30° to the axis of the minor stress.

(OR)

- 23. At certain point in strained material the stresses on two planes at right angles to each other are 20N/mm² and 10N/mm² both tensile. They are accompanied by a shear stress of a magnitude of 10N/mm².find graphically or otherwise the locations of principal planes and evaluate the principal stresses.
- 24. A beam of length 6m is simply supported at its ends and carries two point loads of 48kN and 40kN at a distance of 1m and 3m respectively from the left support. Find (i) the deflection under each load (ii) maximum deflection (iii) the point at which maximum deflection occur. Given $E=2x10^5$ N/mm² and I=85x10⁶mm⁴.

(OR)

25. Find the euler's critical load for a column with one end fixed and other end free. The length of the column is 'l' and subjected to axial load 'P'.