Reg. No. _____

Karunya University

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

End Semester Examination – November / December 2008

Subject Title: MECHANICS OF SOLIDS **Time : 3 hours**
Subject Code: CE203 **Maximum Marks: 60**

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

1. What is the nature of stress developed in a bar when subjected to rise in temperature and prevented from deformation?
2. Define rigidity modulus.
3. Draw the bending moment diagram for a simply supported beam subjected to uniformly distributed load over the entire span.
4. State modular ratio.
5. Draw the variation of normal stress across a circular cross section.
6. The bending moment curve for a UDL is a straight line. Say True or False.
7. Write the expression for normal stress on an inclined plane due to normal stress acting along x direction.
8. Define flexural rigidity of a beam.
9. Define buckling load.
10. Write the value of central deflection for a simply supported beam with UDL over whole span.

PART – B (5 x 2 = 10 MARKS)

11. Define strain energy. Derive the expression for strain energy due to axial force.
12. Explain point of contra flexure.
13. Define helical spring. What are the two types?
14. State the torsion equation with notations.
15. What are the rules to be adopted in using Mecaulay's method.

PART – C (5 x 8 = 40 MARKS)

16. A gas cylinder of internal diameter 1.5 metre is 30mm thick. Find the maximum allowable pressure of gas inside the cylinder, if the tensile stress in the cylinder is not exceed 100N/mm^2. Calculate also the change in length, diameter and volume, if E = 2 x 10^5 N/mm^2 and Poisson's ratio = 0.3

(OR)

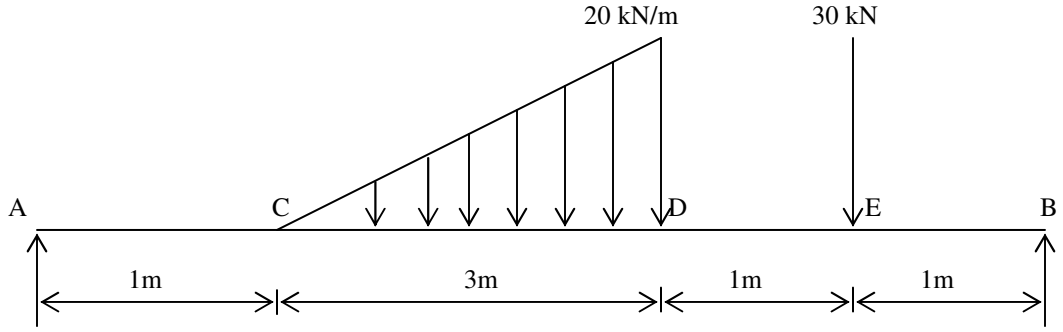
17. A compound bar consists of a central steel strip 25mm wide and 6.40mm thick placed between two strips of brass each 25mm and t mm thick. The strips are firmly fixed together to form a compound bar of rectangular section 20mm wide and (2t + 6.4)mm thick. Determine.
    a. the thickness of the brass strips which will make the apparent modulus of elasticity of compound bar 1.57 x 10^5 N/mm^2 and
    b. the maximum axial pull the bar can then carry if the stress is not to exceed 157 N/mm^2, in either the brass or steel. Take the values of E for steel and brass as 2.07 x 10^5 N/mm^2 and 1.14 x 10^5 N/mm^2.

[P.T.O]

18. A cantilever AB of length ℓ is subjected to downward load P at its free end and an upward load P at a distance a from the free end. Draw S.F and B.M diagrams for the cantilever.

(OR)

19. Draw S.F and B.M diagram for the simply supported beam shown below:



20. A solid shaft is of 60mm diameter. If the maximum shear stress and the angle of twist per metre length are not to exceed 75 N/mm^2 and 1.2° respectively, find the safe torque. If the shaft is to transmit 500 KW under this torque, calculate its speed.
Take modulus of rigidity = .85 x 10^5 N/mm^2.

(OR)

21. A close coiled helical spring is to have a stiffness of 1 N/mm of compression under a maximum load of 45 N and a maximum shear stress of 125 N/mm^2. the solid length of the spring (when the coils ar touching) is to be 45mm. Find (a) the diameter of the wire (ii) mean diameter of the spring and (iii) number of coils. Take N = 0.4 x 10^5 N/mm^2.

22. A rectangular block of material is subjected to a tensile stress of 100 N/mm^2 on one plane and a tensile of 50 N/mm^2 on a plane at right angles, together with shear stresses of 60 N/mm^2 on the sample planes. Find:
    a. the direction of the principle planes.
    b. the magnitude of the principle stresses.
    c. the magnitude of the greatest shear stress.

(OR)

23. Draw "Mohr's stress circle" for principal stresses of 80 N/mm^2 tensile and 50 N/mm^2 compressive, and find the resultant stresses on planes making 22° and 64° with the major principal plane. Find also the normal and tangential stresses on these planes.

24. Derive the equation for the deflection below a point load at the free end of a cantilever.

(OR)

25. A rolled steel joist 600mm x 210mm is simply supported at its ends on a span of 10 metres and carries a uniformly distributed load of 12.5 kN per meter run including its own weight. If the maximum deflection is not to exceed 20mm, and the maximum stress due to bending is not to exceed 140 N/mm^2, find the greatest value f an additional concentrated load which may be added to the joist to the middle of the span. For the joist, take I_{xx} = 7.2868 x 10^8 mm^4 and
E = 2 x 10^5 N/mm^2.