SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – CIVIL
Title of the paper: Mechanics of Solids - I
Semester: III — Max.Marks: 80
Sub.Code: 6C0081(2006-2007) — Time: 3 Hours
Date: 23-04-2009 — Session: AN

PART – A (10 x 2 = 20)

Answer All the Questions

1. State and explain Hooke's law.

2. How are thermal stresses induced?

3. Define bending moment and shear force at a section.

4. Define point of contraflexure.

5. What are the assumptions made in the theory of simple bending?

6. Draw the bending and shear stress distribution across a rectangular section.

7. Is a hollow shaft preferred over a solid shaft? If yes, why?

8. Differentiate between open and closed coiled helical spring.

9. What are the assumptions made in the analysis of frames?

10. What is strain energy density?

PART – B (5 x 12 = 60)

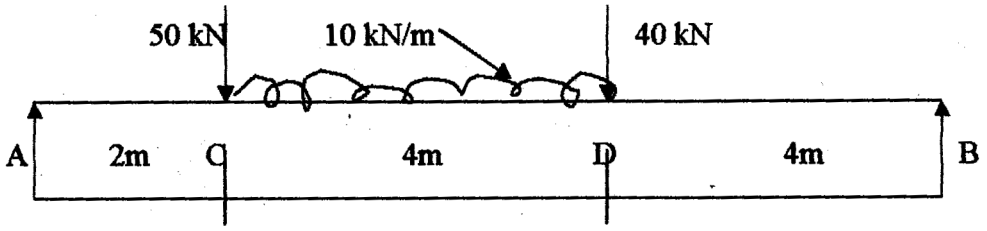
Answer All the Questions

11. A bar 30mm x 30mm x 250mm long was subjected to a pull of 100kN in the direction of its length. The extension of the bar was found to be 0.125mm, while the decrease in each lateral dimension was found to be 0.004mm. Find the Young's modulus, Poisson's ratio, rigidity modulus and bulk modulus of the material of the bar.

(or)

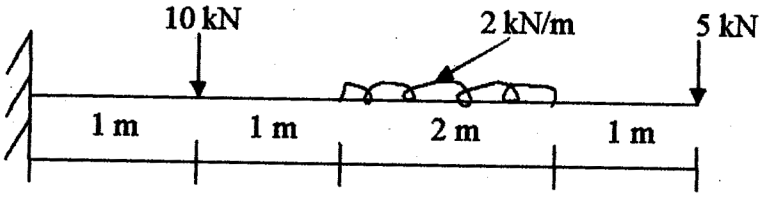
12. A reinforced concrete column is 300 x 300mm in section. The column is provided with 8 bars of 16mm diameter. The column carries a load of 500kN. Find the stresses in concrete and steel bars. Take $E_s = 2.1 \times 10^5 N/mm^2$ and $E_c = 0.14 \times 10^5 N/mm^2$.

13. Draw the shear force and bending moment diagram of the loaded beam as shown in figure.



(or)

14. Draw the shear force and bending moment diagram for a cantilever beam as shown in figure.



15. An I section beam 350mm x 150mm has a web thickness of 15mm and a flange thickness of 30mm. If the shear force acting on the section of 50kN, find the maximum shear stress developed in the I section. Also sketch the shear stress distribution across the section.

(or)

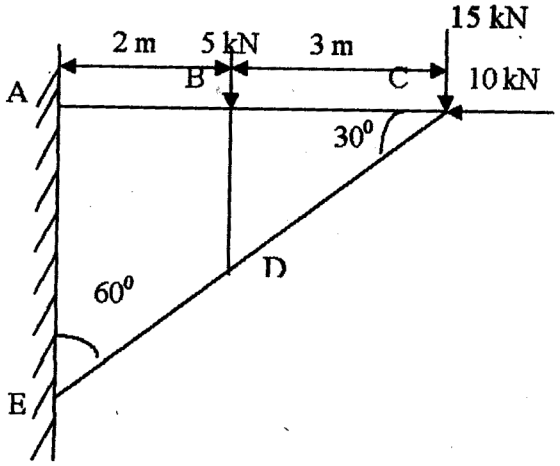
16. A timber beam 150mm wide and 300mm deep is simply supported over a span of 4m. Find the maximum uniformly distributed load that the beam can carry if the bending stress is not to exceed $8N/mm^2$.

17. A closed coil helical spring of 10mm diameter wire with 12 coils of mean diameter 100mm carries an axial load of 500N. Find the shear stress induced and deflection caused. $G = 0.85 \times 10^5 mm^2$.

(or)

18. Find the maximum torque transmitted by a hollow circular shaft of external diameter 350mm, and internal diameter 200m if the shear stress is not to exceed $25N/mm^2$.

19. Analyse the truss shown in figure by method of joints or by method of sections.



(or)

20. Derive relation for strain energy stored due to torsion in solid and hollow circular shaft.