SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.E - CIVIL
Title of the Paper :Mechanics of Solids – I Max. Marks :80
Sub. Code :6C0081 Time : 3 Hours
Date :22/04/2010 Session :AN

PART - A (10 x 2 = 20)

Answer ALL the Questions

1. Define Modulus of rigidity.

2. Define Poisson's ratio.

3. Mention the different types of supports in a beam.

4. Define Point of contraflexure.

5. What is meant by section of modulus?

6. In the case of an I section beam maximum shear stress is at _____.

7. State the function of a spring.

8. What are the different types of springs?

9. What is meant by Resilience?

10. Define Truss.

PART – B (5 x 12 = 60)

Answer All the Questions

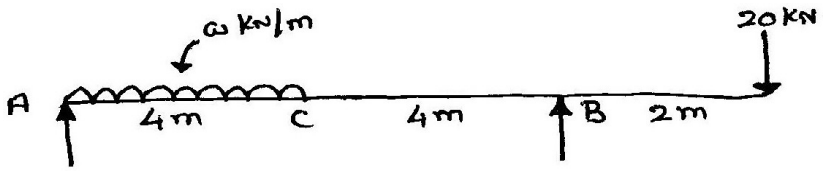
11. A Steel tube 24mm external diameter and 18mm internal diameter encloses a copper rod 15mm diameter to which it is rigidly connected at two ends. If at a temperature of 10°C, there is no longitudinal stress, calculate the stresses in the rod and the tube when the temperature is raised to 200°C. Given $Es = 2.1X10^5 N/mm^2, Ec = 1.0X10^5 N/mm^2.,$

$\alpha_s = 11\times10^{-6}/^\circ C, \alpha_c = 18\times10^{-6}/^\circ C$

(or)

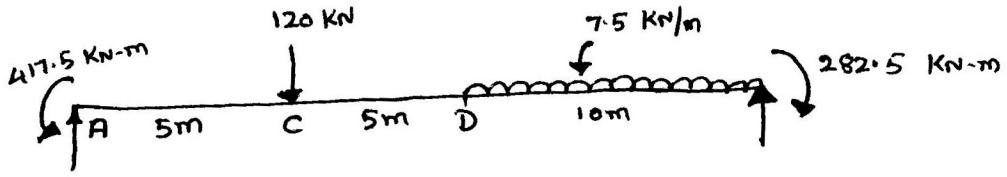
12. A Copper sleeve 21mm internal and 27mm external diameter surrounds a 20mm steel bolt, one end of the sleeve being in contact with the shoulder of the bolt. The sleeve is 60mm long. After putting a rigid washer on the other end of the sleeve, a nut is screwed on the bolt through 10 degrees. Pitch of thread is 2.5mm. Find the stress induced in copper sleeve and steel bolt.

13. For the beam loaded as shown in fig (1) calculate the value of uniform distributed load w, so that Bending moment at C is 50KN-m. Draw the Shear force and Bending Moment diagrams for this beam for the calculated value of w. Locate the point of contraflexure, if any



(or)

14. A beam of 20m span hinged at its both ends is located as shown in fig (2). Determine the reactions at the ends and draw the Bending moment and Shear Force Diagram.



15. A Short column of I section 250mm x 200mm has a cross sectional area 5200mm^2 and maximum radius of gyration 107mm. A vertical load W kN acts through the centroid of the section together with a parallel load of W/4 kN acting through a point on the center line of the web distance 60mm from the centroid. Calculate the greatest allowable value of W if the maximum stress is not to exceed 65MN/m^2. What is the minimum stress?

(or)

16. A cast Iron bracket subjected to bending has a cross section of I Shape with unequal flanges as shown in fig (3). If the maximum compressive stress is not to exceed 20 MN/m^2, What is the bending moment the section can take? If the section is subjected to 80kN, draw the shear stress distribution over the depth of the section.

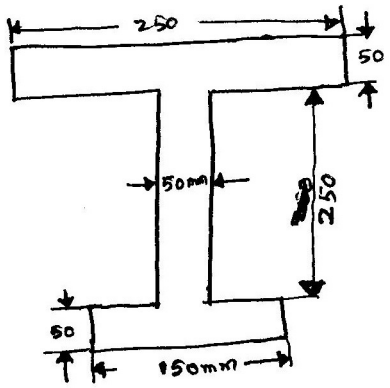


FIG (3)

ALL DIMENSIONS ARE IN mm

17. The maximum normal stress and the maximum shear stress analyzed for a shaft of 150mm diameter under combined bending and torsion were found to be 120MN/m^2 and 80MN/m^2 respectively. Find the bending moment and torque to which the shaft is subjected. If the maximum shear stress is limited to

$100MN/m^2$, find by how the torque can be increased if the bending moment is kept constant.

(or)

18. For a close coiled helical spring subjected to an axial load of 300N having 12 coils of wire diameter of 16mm and made with coil diameter of 250mm. Find (a) Axial deflection (b) Strain energy stored (c) Maximum torsional shear stress in wire (d) Maximum shear stress using Wahl's Correction factor.

19. A bar 1000mm in length is subjected to an axial pull such that the maximum stress is equal to $150MN/m^2$. Its area of cross section is $2cm^2$. Over a length of 950mm and for the middle 50mm length it is only $1cm^2$. If E = 200 GN/m^2, calculate the strain energy stored in bar.

(or)

20. Determine the forces in the members of the frame shown in fig(4) by using Method of Joints.