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: 20302 (2003/ 2004/ 2005) — Time: 3 Hours
Date: 16-11-2006 — Session: FN

PART – A (10 x 2 = 20)

Answer ALL the Questions

1. What are the elastic constants?
2. Draw a stress-strain diagram for mild steel.
3. List out the types of supports.
4. Define the concept of shear force and bending moment.
5. Which is known as neutral axis?
6. What is known as composite beams?
7. Define the term torsional rigidity.
8. List out the different types of springs.
9. What is known as strain energy?
10. Define the term resilience.

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. The ultimate tensile stress of the mild steel bar is given as 480N/mm^2. This tie bar of equal angle section has to carry an axial pull of 180KN. Give suitable dimensions for the section of its mean thickness is 10mm. Use factor of safety as 4.

(or)

12. A steel bar of rectangular cross section 2 cm x 1 cm is subjected to a pull of 20000N in the direction of its length. Its E=2.04x10^{7}N/cm^2 and m = $\frac{10}{3}$, find the length of the sides of

the cross section and percentages decrease of area of cross section.

13. Draw the shear force diagram and bending moment diagram for the given cantilever beam structure.

diagram

(or)

14. Draw the shear force diagram and bending moment diagram for the beam with overhang at one end and uniformly distributed load over the whole length.

diagram

15. A timber beam is freely supported on walls 6m apart. It carries a uniformly distributed load of 12 KN/m and a concentrated load of 9 kN at 2.5 m from the left side wall. If the stress in timber is not to exceed 8 kN/cm^2 design a suitable section making the depth twice the width.

(or)

16. A cast iron beam section of I section with a top flange 8 cms x 2cms thick, bottom flange 16 cms x 4cms thick and the web 20cms deep and 2 cms thick. The beam is freely supported on a span of 5 m. If the tensile stress is not to exceed 2 kN/cm^2, find the safe UDL which the beam can carry.

17. Find the maximum torque that can be applied safely to a shaft of 30 cm diameter. The permissible angle of twist is 1.5 degree in a length of 7.5 m length and shear stress not to exceed 4.2 kN/cm^2. Take C = 8.44 x 106 N/cm^2.

(or)

18. A left spring is to be made of seven steel plates 6.5 cm wide and 6.5 mm thick. Calculate the length of the spring, so that it may carry a central load of 2.75 kN the stress being limited to 16KN/cm^2. Also calculate the deflection at the centre of the spring. Take E = 2.1 x 10^7 N/cm^2.

19. A rectangular body 500 mm long and 100 mm wide and 50mm thick is subjected to a shear stress of 8 kN/cm^2. Determine the strain energy stored in it. Take shear modulus as 0.84 x $10^7 N/cm^2$.

(or)

20. An unknown weight falls through 10mm on a collar, rigidly attached to the lower end of a vertical bar, 3 m long and 6 cm^2 in cross section. If the maximum instantaneous extension is known to be 2mm, what is the corresponding stress and the value of unknown weight. Take E = 2 x 10^7 N/cm^2.