SATHYABAMA UNIVERSITY

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Course & Branch: B.E - CIVIL
Title of the paper: Mechanics of Solids - I
Semester: III Max. Marks: 80
Sub.Code: 20302 (2003/2004/2005)/6C0081 Time: 3 Hours
Date: 23-04-2008 Session: AN

PART – A (10 x 2 = 20)

Answer All the Questions

1. The Poisson's ratio of materials is 0.3 and its young's modulus is 2.0×10^{-5} N/mm^2. What is the value of the Modulus of rigidity?
2. Define Shear strain and shear stress?
3. A simply supported beam of span 8 varies a concentrated load of 10 KN at 2 m from the left support. What is the maximum bending moment?
4. Define Shear force and bending moment?
5. What do you mean by section modulus of a beam section?
6. State all the assumption made in theory of simple bending?
7. State the theory of torsion?
8. Distinguish between closed and open-coiled helical springs?
9. Distinguish between suddenly applied load and impact load?
10. The proof stress in a specimen is 20 N/mm^2 and the young's modulus is 2×10^5 N/mm^2. What is the modulus of resilience?

PART – B (5 x 12 = 60)

Answer All the Questions

11. Write short notes on the following
    a) Elasiticity
    b) Plasticity
    c) Ductility
    d) Brittleness

e) Malleability
f) Hardness
g) Toughness
h) Strength
i) Stress – Strain Diagram

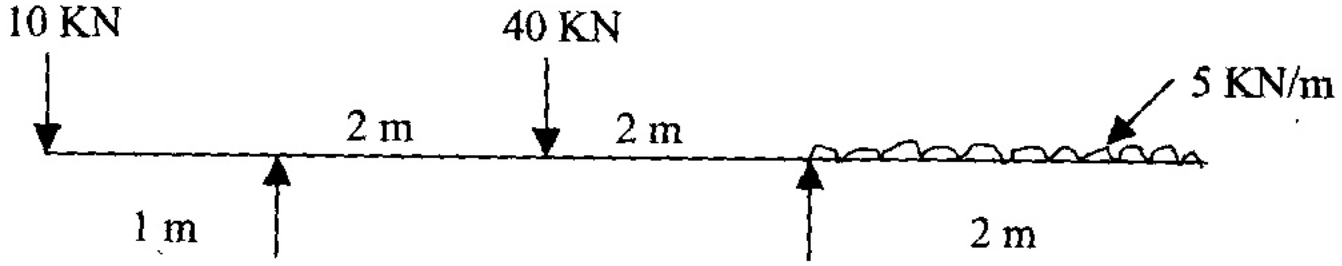
(or)

12. A bar of 30 mm diameter is subjected to a pull of 60 KN. The measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039. Calculate the Poisson's ratio and elastic constants?

13. A beam AB of length 4 m is simply supported at its ends. The beam is subjected to a uniformly distributed load of intensity 25 KN/m over 1.5 m length from A, a moment of 30 KN – m in the clockwise direction at 2 m from A and a concentrated load of25 KN at 3 m from A. Draw the shear force and bending moment diagrams.

(or)

14. Draw the shear force and bending moment's diagram of the beam as shown in fig.



15. An I section girder 120 mm deep has the following cross-sectional dimensions. Top flange 60 mm wide by 10 mm thick. Bottom flange 120 mm wider by 10 mm thick, web 10 mm thick and 100 mm deep. The girder is 5 m long simply supported over a span of 3 m. Overhanging both supports by the same amount and its carries a concentrated load of 3 KN each end. Find the maximum stress in the material due to bending.

(or)

16. Define section modulus and derive the expression for the following sections.
    (i) Rectangular section
    (ii) Circular section and
    (iii) Hollow circular section

17. Derive the expression for the deflection of a close coiled helical spring subjected to an axial load.

(or)

18. A hollow circular shaft whose internal diameter is 3/8 times external diameter is to transmit 600 kw at 90 rpm. Find the permissible diameter, if the maximum shear stress is not to exceed 65 Mpa and the twist over a length of 3m is not to exceed 1.5 degrees. G = 84 Gpa.

19. A bar is of 5m length and is made of two parts, 3m of its length has a cross-sectional area of 12 cm^2 and the remaining length has a cross-sectional area of 24 cm^2. An axial tensile load of 50KN is gradually applied. Compute the total strain energy produced in the bar. Also find the total strain energy produced in a uniform bar of the same length and having the same volume when under the same level. Take
    $E = 2x10^5$ N/mm^2.

(or)

20. An element in a thin body is subjected to tensile stress of 120 Mpa along x-direction and 60 Mpa (tensile) along y-direction and at four edges are subjected to shear stress of 90 Mpa. (Positive shear stress in 120Mpa plane and negative shear stress in 60 Mpa plane). Compute the principal plane orientation, principal stresses and maximum shear stress either graphically or analytically.