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B.E / B.Tech (Full Time) DEGREE END SEMESTER ARREAR EXAMINATIONS, APRIL / MAY 2014

MATERIAL SCIENCE AND ENGINEERING

Third Semester

ML 9203-Strength and Testing of Materials

(Regulation 2008)

Time : 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Give the relationship between Young's modulus and Rigidity modulus.
2. Define strain hardening.
3. What is the maximum deflection of a simply supported beam of span 'L' m subjected to uniformly distributed load 'w' kN/m throughout the whole span?
4. Determine the section modulus of a hollow circular section of external diameter 40 mm and internal diameter of 20 mm?
5. Define true fracture strain.
6. What is ductility?
7. Define hardness.
8. What are the different types of indentation hardness?
9. Define torsional stiffness.
10. Differentiate between a close-coiled and open-coiled helical spring.

Part – B (5 x 16 = 80 marks)

11. Draw the shear force and bending moment diagrams for the simply supported beam loaded as shown in Fig Q.11. (16)

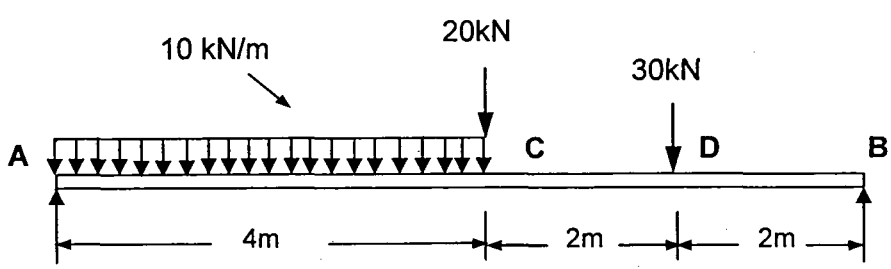

Fig Q.11

12. a) A concrete column of cross-sectional area 400 mm x 400 mm is reinforced by four longitudinal 50 mm diameter round steel bars placed at each corner. If the column carries a compressive load of 300 kN, determine the loads shared and the compressive stresses produced in the concrete and the steel bars. Take Young's modulus of steel as 15 times that of concrete. (16)

(OR)

b) A 0.4 m long steel rod of 20 mm diameter is subjected to an axial blow which produces an instantaneous stress of 100 N/mm^2. If the same bar is machined down to 10 mm in diameter in the middle half of the portion for a length of 0.2 m, and is subjected to the same axial blow, find the maximum axial stress. Take Young's modulus as $2x10^5$ N/mm^2. (16)

13. a) Explain in detail the engineering stress strain curve of mild steel. (16)

(OR)

b) Discuss in detail the factors that affect the tensile properties of steel. (16)

14. a) Write short notes on (i) Microhardness Test (5)
(ii) Meyer's hardness (5)
(iii) Charpy impact (6)

(OR)

b) A tubular strut pin jointed at both ends has outer and inner diameters as 40 mm and 36 mm respectively and is 2.4 m long. Compare the crippling loads given by Euler's and Rankine's formulae. Take Young's modulus as $2.04x10^5$ N/mm^2 Rankine's constant as 1/7500 and maximum compressive stress as 310 N/mm^2. If the elastic limit stress is taken as 220 N/mm^2, find the length below which the Euler's formula ceases to apply. (16)

15. a) (i) State the assumptions in theory of pure torsion. (4)

(ii) A hollow propeller shaft of a steam ship is to transmit 3750 kW at 240 rpm. If the internal diameter is 0.8 times the external diameter and if the maximum shear stress developed is to be limited to 160 N/mm^2, determine the size of the shaft. (12)

(OR)

b) A close- coiled helical spring whose free length when not compressed is 150 mm, is required to absorb strain energy equal to 50 Nm when fully compressed with the coils in contact. The maximum shear stress is limited to 140 N/mm^2. If the mean coil diameter is 100 mm, find the diameter of the steel wire and number of coils. Take modulus of rigidity as $0.8 x10^5$ N/mm^2. (16)