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B.E./B.Tech.(Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2013

MATERIAL SCIENCE AND ENGINEERING BRANCH

THIRD SEMESTER

(5)

ML 9203 – STRENGTH AND TESTING OF MATERIALS

(REGULATIONS 2008)

Time : 3 hrs Max Marks : 100

Instructions: 1. Assume any relevant data if found necessary

Answer ALL Questions

Part – A ( 10 x 2 = 20 Marks )

1. When will thermal stresses be induced in a specimen?
2. Define stiffness.
3. What are the assumptions made in Euler's column theory.
4. Find the reactions of a cantilever beam of length 'L' m subjected to an uniformly distributed load of 'w' kN/m throughout its span.
5. State Mohr's first theorem.
6. What is indicated by percentage elongation and percentage reduction in area?
7. Define micro hardness.
8. What is toughness?
9. Give the formula for power transmitted by a shaft.
10. What is the significance of Wahl's correction factor?

**Part – B ( 5 x 16 = 80 Marks )**

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

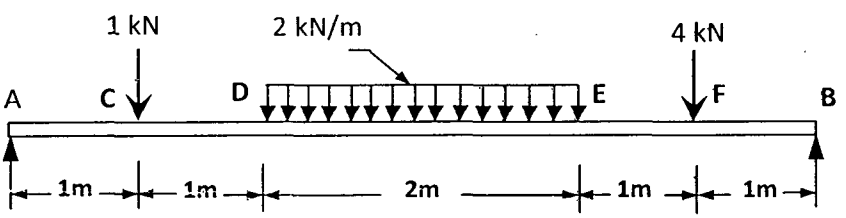


Fig.11

12. (a) A copper rod, 12 mm diameter and 400 mm long, fits into an aluminium tube of external diameter 20 mm and thickness 4 mm of equal length. If the assembly is held together by a rigid plate at the end and is stress free at 20°C, find the stresses in the two materials when it is heated to 60°C. Take Young's modulus of copper and aluminium as 120 GPa and 70 GPa respectively and coefficient of thermal expansion of copper and aluminium as $18 \times 10^{-6}$ /°C and $23 \times 10^{-6}$ /°C respectively. (16)

**(OR)**

(b) A beam AB of 5 m span is simply supported at the ends. It carries a point load of 20 kN and 30 kN at a distance of 1m and 4 m respectively from the end A. An uniformly distributed load of 10 kN/m for a length of 2 m starting at a distance of 1 m from end A. Take the Young's Modulus and moment of inertia as 200 $kN/mm^2$ and $60x10^6$ $mm^4$ respectively. Determine the deflections at distance of 1m, 3 m and 4m from end A. (16)

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

**(OR)**

(b) Discuss in detail the instability in tension and the stress distribution at the neck region. (16)

14. (a) Write short notes on (i) Rockwell Hardness (5)
(ii) Brinell Hardness (5)
(iii) Vickers hardness (6)

**(OR)**

(b) Explain in detail the various metallurgical factors affecting the Ductile to Brittle Temperature Transition curve. (16)

15. (a) Compare the weight of solid shaft with that of a hollow one having the same length to transmit a given power at a given speed, if the material used for both the shaft is same. Take the inside diameter of the hollow shaft as 0.6 times the outer diameter. (16)

**(OR)**

(b) A close coiled helical spring is made out of 12 mm diameter steel rod. The coil consists of 16 complete turns with a mean diameter of 100 mm. The spring carries an axial pull of 400 N. Find the maximum shear stress induced in the section of the rod. If modulus of rigidity is 84 $GN/m^2$, find the deflection of the spring, the stiffness and the strain energy stored in the spring. (16)