Roll No.										

B.E/ B.Tech (Full-Time) DEGREE ARREAR EXAMINATION, APR/MAY 2011

MATERIAL SCIENCE BRANCH

(2)

THIRD SEMESTER

ML9203 – STRENGTH AND TESTING OF MATERIALS

(REGULATIONS 2008)

Time: Three hours Max. Marks: 100

Instructions: 1. Assume any relevant data if found necessary

2. All measurements are in SI units

Answer ALL Questions

PART A – (10 x 2 = 20 marks)

1. Define Rigidity modulus.
2. How is thermal stress induced?
3. Sketch the stress-strain behaviour of a MS rod when subjected to a tensile test showing all the salient points.
4. Write Euler's equation for critical load of a column pinned at both the ends.
5. How is impact resistance of a material calculated?
6. How is hardness of rubber determined?
7. Write the torsion equation.
8. What is angle of helix in a helical spring?
9. Write any two assumptions made in the theory of simple bending.
10. Draw the conjugate beam for a cantilever beam.

PART B – (5 x 16 = 80 marks)

11. Give a detailed account of (i) Rockwell's Hardness Test (8)

(ii) Vicker's Hardness Test (8)

12. (a) A compound bar consists of a circular rod of steel of diameter 20mm rigidly fitted into a copper tube of internal diameter 20mm and external diameter 30mm. If the bar is subjected to a load of 250 kN, find the stresses developed in the two materials. $E_s = 2 \times 10^5$ N/mm^2, $E_c = 1.2 \times 10^5$ N/mm^2.

Or

(b) A steel tube of 50mm diameter is fitted into a copper tube of inner diameter 50mm and outer diameter 70mm. The ends of the tube are rigidly fixed. If the length of the tube is 750mm, find the stresses produced when the temperature is raised by

30 °C. Take E_s = 200 GPa; $\alpha_s = 12 \times 10^{-6}$ /°C.; E_c = 120 GPa; $\alpha_c = 17.5 \times 10^{-6}$ /°C

13. (a) A beam ABCD is simply supported at A and D. AB = 1m, BC =1m, CD=2m. The beam carries a point load of intensity 15 kN at B and a udl of intensity 20 kN/m between C and D. Draw the shear force and bending moment diagrams showing all the salient points.

Or

(b) A beam ABCD is simply supported at A and D. AB = 1m, BC =3m, CD=2m. The beam carries a udl of intensity 15 kN/m between B and C. Take EI = 5×10^4 kNm^2. Calculate the slope at the supports and the deflection at midspan.

14. (a) Explain in detail the influence of temperature and strain-rate on the stress-strain behaviour of metals.

Or

(b) Discuss the need for conducting a notch-tensile test and the detailed procedure for conducting the test.

15. (a) A solid shaft transmits 250 kW at 200 rpm. If the shear stress is not to exceed 80 MPa, what should be the diameter of the shaft? If this shaft is to be replaced by a hollow one with internal diameter = 0.6 times the outer diameter, determine the size and the percentage saving in weight, the maximum shear stress being the same for both.

Or

(b) (i) A close-coiled helical spring made of a 20mm dia. wire has 20 complete turns and a mean dia. of 150mm. It is subjected to an axial pull of 600N. Taking shear modulus as 80GPa, determine the stiffness, deflection, max. shear stress and energy stored in the spring.
