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Roll No										

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2012

MATERIALS SCIENCE & ENGINEERING BRANCH

FIFTH SEMESTER

ML9302 – MATERIAL ASPECTS IN DESIGN

(REGULATIONS 2008)

Time: 3 hours Max.Marks: 100

Answer ALL Questions.

Part – A (10X 2=20 Marks)

1. How do you classify materials for engineering use?

2. Why are metals in their pure form unsuitable for industrial use?

3. What are the salient features used in the design of forgings?

4. Define weldability and give expressions for Carbon Equivalent (CE).

5. What do you understand by the Interchangeability?

6. Define Surface Roughness and its measurement.

7. Describe the procedure for finding out the stresses in a composite bar.

8. Define Stress Concentration with one example.

9. State Maximum Shear Stress Theory.

10. Write the difference between Fluctuating stress, Repeated stress and Reversed stress.

Part – B (5X 16=80 Marks)

11. a.i) Define the term interchangeability and discuss the terms used in interchangeable system. (10)

ii) A journal of nominal or basic size of 75 mm runs in a bearing with close running fit. Find the limits of shaft and bearing. What is the maximum and minimum clearance? The shaft designated as 75 H 8 / g 7. (Diameter steps =50 & 80 mm, IT 8 = 25 i, IT 7 = 16 i, & $es = -2.5 (D)^{0.34}$). (6)

12. a. Explain briefly the performance characteristics of materials and requirements in design. (16)

(Or)

b. Explain briefly the Economics of Materials and Recycling of Materials in detail. (16)

13. a. What do you understand by hot working of metal? Describe briefly the various hot working processes and state its advantages and limitations. (16)

(Or)

b. Write short notes on:

i) Role of Processing in Designing (8)
ii) Discuss the castability criteria of materials in Detail. (8)

14. a. i) Explain the term Design against static and fluctuating load. (8)

ii) A hollow shaft is required to transmit 600 kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 meters not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter is 3/8. Take modulus of rigidity as 84 GPa. (8)

(Or)

b.i) Discuss the materials and practical applications for the various types of springs. (6)

ii) A helical-compression spring of a cam-mechanism is subjected to an initial preload of 50 N. The maximum operating force during the load-cycle is 150 N. The wire diameter is 3 mm, while the mean coil diameter is 18 mm. The spring is made of oil-hardened and tempered valve spring wire of grade VW (S_{ut}= 1430 N/mm^2). Determine the factor of safety used in the design. (Take K = 1.253 & K_S = 1.083). (10)

15. a. i) Write short note on Rankine's theory and maximum distortion energy theory. (6)

ii) A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m.Determine the diameter of the shaft using two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and poisson's ratio = 0.25. (10)

(Or)

b. i) Write short note on Designing with plastics and brittle materials (8)

ii) A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700 MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.62 for fatigue load. Use Goodman straight line as basis for design. (8)
