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

MATERIALS SCIENCE AND ENGINEERING

V SEMESTER -- (REGULATIONS 2008)

(13)

ML 9302 – MATERIAL ASPECTS IN DESIGN

Time: 3 hours Maximum marks: 100.

PART – A (10 x 2 = 20 Marks)

1. List the material requirements for an automatic exhaust system
2. List the four criteria for materials selection
3. Specify the difference between open-die and closed-die forging
4. Give the classification of metal- cutting process based on tool motion
5. List the factors influencing the fatigue failure
6. What is meant by crevice corrosion
7. What is meant by load factor for endurance limit
8. A beam of rectangular cross section is subjected to bending moment of 120Nm. The maximum bending stress is 40MPa. Find the width and depth of the beam if depth is twice that of width.
9. List the functions of spring
10. What is meant by solid length and free length in springs?

PART – B (5 x 16 = 80 Marks)

11. Describe the material selection process for a new and existing design. **(16)**

12. (a) A transmission shaft made of C45 steel (yield stress 360MPa, ultimate stress 650MPa) is subjected to the fluctuating torque which varies from -100 Nm to 500Nm. Also a fluctuating bending moment acts on the shaft that varies from +500Nm to - 500Nm. Let the stress concentration factor be 2. Factor of safety 1.5. Determine the shaft size. **(16)**

(OR)

(b) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6mm. Assume a spring index of 5. The permissible shear stress intensity is 420MPa and modulus of rigidity 84kN/m^2. Neglect the effect of stress concentration. **(16)**

13. (a) A shaft is supported on bearings A and B, 80mm between centres. Spur gear having 600mm pitch diameter is located 200mm to the right of the left hand bearing A and a 700mm diameter pulley mounted 250mm towards the left of the bearing B. The gear is driven by a pinion with a downward tangential force while pulley drives a horizontal belt having 180° wrap angle. Pulley also serves as a flywheel and weighs 2000N. Maximum belt tension is 3000N and the tension ratio is 3:1. Determine the shaft diameter. Shaft material C45 (bending stress 240MPa) **(16)**

(OR)

(b) A C.I pulley transmits 10kW at 400rpm. The diameter of the pulley is 1.2m and it has four straight arms of elliptical cross section, in which major axis is twice the minor axis. Design the arm, if the bending stress is 15MPa. **(16)**

14. (a) What is meant by DFM? Write in detail about the guidelines of DFM. **(16)**

(OR)

(b) Explain in detail about the guidelines of Design for Casting **(16)**

15. (a) Explain in detail about the guidelines of Design for Corrosion **(16)**

(OR)

(b) Explain in detail about the guidelines of Designing with plastic materials. **(16)**