B. E. (Full Time) Degree End Semester Examination 2011 Arrear
Materials Science and Engineering Branch Regulations 2008
ML 9302 – Materials Aspects in Design

21

Time: 3 hours **Maximum Marks: 100**

Answer All Questions

Part – A (10 x 2 = 20 Marks)

1. The word "design" can have different meanings. Explain two of these meanings.
2. Good thermal insulation and corrosion resistance to high temperature – for which component are these material properties important?
3. A Hybrid material made of a metal and a ceramic is called a: .....
4. Which two parameters are normally used to quantify the ecological impact in the production and selection of materials?
5. Which engineering material is used in the largest volume?
6. Which natural material has the maximum use (by weight and volume)?
7. After ferrous materials which metal is used most extensively?
8. Which is the most used polymer (by weight).
9. Glass mainly contains which chemical element?
10. Expand the abbreviation of GFRP:

Part – B (5 x 16 = 80 Marks)

Question 11 (16 marks) The following lists a combination of a material and an object. Explain which material properties are important for the function of these objects.

(4 marks) Copper kettle

(4 marks) Glass Lens

(4 marks) Aluminium aircraft

(4 marks) Concrete house

Question 12a . (16 marks) To compare and evaluate different materials, we formulate materials indices. For tensile fracture, derive the material index for selecting the best strength at minimum weight. What are the physical units?

OR Question 12b.(16 marks) Materials can be welded in many ways. Discuss at least 4 such processes and the materials that can be used for this process.

Question 13a (16 marks). Conflicting objectives in selecting the optimal material:
When selecting a material, often the optimization objectives are conflicting. We have developed different concepts to optimize the selection in this situation. Describe the method. Do we need any additional information arrive at a decision?

OR Question 13b (16 marks) Civil structures are designed for static loading and shock loading (i.e. earth quakes). Why did the Tacoma Bridge fail, though it was strong enough to support its weight and payload and had a factor of safety for peak loads. Explain the physical principle of excessive loading.

Question 14a (16 marks) Materials can be classified in five groups. Which are these and what are the main properties these groups have in common

OR Question 14b (16 marks) The shape of a material can have decisive effect on the performance of a component.. Explain which shapes are efficient for different loading conditions. What is the limitation of materials?

Question 15a (16 marks) Strength of a structure or component not only depends on the material, but also on the microscopic and macroscopic configuration. Explain different configurations and the effect on material properties.

OR Question 15b (16 marks) Electrical conductivity of a polymer can be switched on and off. Explain the concept. Give 4 examples where material properties are influenced by this process.