GANPAT UNIVERSITY
M.TECH. SEM. – I (CAD/CAM) MECHANICAL ENGINEERING
REGULAR EXAMINATION JANUARY 2013
SUB.: 3ME111 - MATERIAL SCIENCE & TECHNOLOGY

TIME: 3 Hrs. **Max. Marks:70**

Instructions:

i) **Attempt all questions.**
ii) **Figures to the right indicate full marks.**
iii) **Two sections must be written in separate answer sheets.**

SECTION – I

Q-1 **11**

(a) Differentiate between primary and secondary bonding. Also differentiate between ionic and covalent bonding along with characteristics of materials bonded with ionic and covalent bonding.
(b) Explain point defects in detail.
(c) Explain low angle grain boundry and high angle grain boundary in detail.

Q-2 **12**

(a) Explain phase transformation of white and malleable cast iron with slow, moderate and fast rate of cooling along with its microstructure, properties and applications.
(b) Explain the significance of T.T.T. diagram on heat treatment of steel.
(c) Differentiate between austempering and martempering process.

OR

Q-2 **12**

(a) Explain Asbhy's model of deformation of polycrystal.
(b) Explain strain hardening. Also discuss mechanism of recovery, recrystallization and grain growth.
(c) What is creep? Explain the creep curve in detail.

Q-3 **12**

(a) What is fracture? Explain Griffith theory of brittle fracture
(b) What is ductile-brittle transition temperature? Explain significance of ductile-brittle transition temperature.
(c) What is fatigue? Explain the effect of following factors on fatigue life:
  i) Surface effects
  ii) Environment effects

OR

Q-3 **12**

(a) What is the need of strengthening the materials? Explain different strengthening mechanism in solid.
(b) Explain strengthening mechanism of solids by martensite strengthening.
(c) Write short note on grain boundary strengthening

SECTION – II

Q-4 12

(a) What is corrosion? Differentiate between direct corrosion and electrochemical corrosion. Also enlist factors affecting rate of corrosion

(b) Enlist and explain corrosion prevention techniques.

(c) What is intergranular corrosion? Explain prevention measure of intergranular corrosion.

Q-5 11

(a) Differentiate between non-crystalline and crystalline materials. Also write short note on glass forming.

(b) Differentiate between diamond & graphite. What are fullerences? Why the property of graphite and diamond has differences?

(c) Enlist classification of ceramic fabrication techniques. Explain any two different techniques.

OR

Q-5 11

(a) Discuss the effect of crystalline structure and molecular weight on properties of polymer.

(b) Explain the method of polymerization in detail.

(c) Explain the effect of following on properties of polymers:

i) Stabilizer

ii) Plasticizers

Q-6 12

(a) Enlist classification of composite based on matrix material. Explain importance of reinforcement & matrix in composite material

(b) What is polymer matrix composite? Enlist commonly used reinforcement and matrix material of PMCs.

(c) Write short note on: Carbon fiber

OR

Q-6 12

(a) What is ceramic matrix composite? Write down properties & application of commonly used CMCs.

(b) Explain properties, applications & fabrication methods of carbon fiber composite

(c) Write short note on: Types of rubbers, Its structures, properties & applications.

End of Paper