

GANPAT UNIVERSITY
M.Tech. Sem I (AMT) Mechanical Engineering
January -2012 Examination
3ME101 Material Science

Time: 3 Hour

Total 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) Explain bonding in solid. Differentiate between primary and secondary bonding.
 - (b) Differentiate between ionic and covalent bonding along with characteristics of materials bonded with ionic and covalent bonded.
 - (c) Explain imperfection in solids. Differentiate between edge and screw dislocation.

OR

- Q-1 11
- (a) What is the importance of phase diagram? State and explain Gibbs phase rule.
 - (b) Explain the phase transformation of white and malleable cast iron with slow, moderate and fast rate of cooling along with its microstructure, properties and applications.
 - (c) Explain following process in detail:
 - i) Austempering
 - ii) Martempering

- Q-2 12
- (a) Explain Ashby's model of deformation of polycrystal.
 - (b) What is solid solution strengthening? Discuss effects of solute alloy addition on stress-strain curve.
 - (c) What is precipitation hardening? Explain the process of precipitation hardening.

OR

- Q-2 12
- (a) Enlist mechanism of fracture in solid. Also explain Griffith theory of brittle fracture.
 - (b) What is ductile fracture? Differentiate between fatigue and creep.
 - (c) Write short note on: Endurance limit.

- Q-3 12
- (a) Explain strain hardening. Also discuss mechanism of recovery, recrystallisation and grain growth.
 - (b) Explain effects of following factors on fatigue life:
 - i) Surface effects,
 - ii) Environmental effects
 - (c) What is ductile-brittle transition temperature? What are the significances of ductile-brittle transition temperature?

Section II

Q-4

- (a) What is corrosion? Differentiate between electrochemical and galvanic corrosion. 12
- (b) What is erosion-corrosion? Discuss effects of following factors to erosion-corrosion:
Surface film, Velocity, Turbulence, Impingement and Galvanic effect.
- (c) Write short note on: selective leaching

OR

Q-4

- (a) Enlist corrosion prevention techniques & discuss cathodic protection in detail. 12
- (b) What is Stress corrosion cracking? Discuss the stress effect on corrosion.
- (c) What is pitting corrosion? Explain autocatalytic nature of pitting.

Q-5

- (a) Explain the interfaces in composite. 11
- (b) Explain Fiber reinforced plastics. Discuss the functions of reinforcement and matrix materials.
- (c) What is the role of additives in polymer? Discuss various additives with examples.

OR

Q-5

- (a) Explain classification of polymers along with its fields of application. 11
- (b) Discuss the cross linking mechanism for polymers and discuss the effect of cross linking on properties of polymers.
- (c) Explain addition polymerization & Copolymerization.

Q-6

- Write short note on any three of the following. 12
- (a) hybrid composites
- (b) Corrosion prevention by environment modification and design.
- (c) Glass forming.
- (d) Passivity
- (e) Smart materials.

End of Paper