GANPAT UNIVERSITY

M.Tech. [ME-(CAD-CAM)] SEM-I CBCS (NEW) Regular Theory Examination Nov.-Dec.-2015

3ME111-MATERIAL SCIENCE & TECHNOLOGY

Time: 3 Hours **Total Marks: 60**

Instructions: i) Answer two sections must be separately.
ii) Figures to the right indicate full marks.
iii) Assume suitable data if necessary.

Section I

Q.1

[a] Give an explanation as to why covalently bonded materials are generally less dense than ionically or metallically bonded ones. **03**

[b] Differentiate between ionic and covalent bonding with reference bonding characteristics and property. **04**

[c] What is secondary bonding? Explain with suitable examples. **03**

OR

Q.1

[a] Explain point defects in detail. **03**

[b] Differentiate between edge and screw dislocation. **04**

[c] Define burger vector. Also explain twin boundary. **03**

Q.2

[a] Explain significance of Fe-C equilibrium diagram with respect to heat treatment of steel. **04**

[b] Why hardening is always followed by tempering process? Explain structural changes occurred during tempering process. **03**

[c] Differentiate between austempering and martempering process. **03**

OR

Q.2

[a] Explain how grain boundaries impede dislocation motion and why a metal having small grains is stronger than one having large grains. **04**

[b] Explain solid solution strengthening in detail. **03**

[c] Explain recovery, recrystallization and grain growth. **03**

Q.3

[a] Describe the mechanism of crack propagation for both ductile and brittle modes of fracture. **03**

[b] Define and explain fracture toughness. **04**

[c] Differentiate between stress intensity factor and plain strain fracture toughness. **03**

Section - II

Q.4

[a] Define creep and specify the condition under which it occurs. 03

[b] Enlist three metallurgical/processing techniques that are employed to enhance the creep resistance of metal alloys. 03

[c] Explain creep curve in detail. 04

OR

Q.4

[a] Explain following types of crystal structure: 03
i) Spinel, ii) Pervoskite

[b] Explain silicate structure in details. 04

[c] Give classification of ceramic materials on the basis of application; Also sketch classification scheme for ceramic forming techniques. 03

Q.5

[a] Enlist the differences in behavior and molecular structure for thermoplastic and thermosetting polymers. 03

[b] Describe a typical polymer molecule in terms of its chain structure and in addition, how the molecules may be generated by repeating mer units. 04

[c] Briefly describe addition and condensation polymerization mechanisms. 03

OR

Q.5

[a] Name the three main divisions of composite materials, and cite the distinguishing feature of each. 04

[b] Briefly describe pultrusion, filament winding and prepreg production fabrication processes. 04

[c] Explain role of matrix and reinforcement in composite materials. 02

Q.6 **Write short notes on the following:(Any Two)** 10

[a] Polymer additives
[b] Intergranular corrosion
[c] Injection moulding
[d] Functionally gradient materials
[e] Pitting corrosion

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