

3E1632

B.Tech. (Sem.III) (Main/Back) Examination, 2015
Mechanical Engineering
3ME2 Material Science and Engineering

Time : 3 Hours

Total Marks : 80
Min. Passing Marks : 26**Instructions to Candidates :**

Attempt any five questions selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

- UNIT-I**
1. (a) Describe and illustrate the edge and screw type dislocations. What types of strain field surrounds both type of dislocations? (8)
 (b) Describe the formation of grain boundaries and explain how grain boundaries affect properties of materials. (8)
- OR**
1. (a) What is slip? Explain the slip systems present in B.C.C., F.C.C. and H.C.P. crystal systems. (8)
 (b) What is re-crystallization temperature? What are the factors which effect re-crystallization temperature? When cold worked material is heated how the following are affected ; (8)
 (i) Internal residual stress (ii) Hardness
 (iii) Strength (iv) Ductility
- UNIT - II**
2. (a) Distinguish between homogeneous and heterogeneous nucleation for solidification of a pure metal. How does degree of under-cooling affect the critical nucleus size? (8)
 (b) Draw an equilibrium diagram of binary system with limited solid solubility in solid state and in which solubility decreases with decrease in temperature, also explain it briefly. (8)
- OR**
2. Draw iron carbon equilibrium diagram and explain different microstructures of iron carbon alloys at different temperatures and also explain:
 (a) Eutectic system (b) Eutectoid system
 (c) Peritectic system present in the diagram. (8+5+3=16)
- UNIT - III**
3. (a) Draw an isothermal transformation diagram for a plain carbon eutectoid steel and indicate various decomposition products on it. Explain what incubation period is and how transformation of Austenite takes place? (10)
 (b) What is Martensitic transformation and also explain its characteristics. (6)
- OR**
3. (a) What is hardening process? Explain the factors which affect hardenability of steel. (7)
 (b) Differentiate between the following:
 (i) Austempering and Martempering
 (ii) Carburising and Nitriding
 (iii) Annealing and Normalising (9)
- UNIT - IV**
4. (a) What are plasticizers? Why they are used in polymeric materials? How do plasticizers affect the strength and flexibility of polymeric material? What types of plasticizers are used in PVC? (8)
 (b) Explain some of the methods which are generally used for strengthening of thermoplastics. (8)
- OR**
4. (a) Explain the effect of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel. (10)
 (b) Write short note on:
 (i) Stainless steel
 (ii) HSLA steel (6)
- UNIT - V**
5. (a) Explain tensile test, specifying standard specimen which is used for test. Explain which properties of material can be determined using this test. (8)
 (b) What are different types of fractures? Explain Griffith's theory of brittle fracture. (8)
- OR**
5. (a) Explain different processing steps used for producing high strength, high modulus carbon fibres from polyacrylonitrile processor material. (8)
 (b) Explain various properties and applications of Nanostructured materials. (8)

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