

CBCS SCHEME

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15ME32

Third Semester B.E. Degree Examination, Aug./Sept.2020 Material Science

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With neat sketch, explain line defects in crystal imperfections. (06 Marks)
- b. State and explain Fick's first law of diffusion. (04 Marks)
- c. With neat sketch, explain plastic deformation of single crystal by slip and twinning. (06 Marks)

OR

- 2 a. What is Fatigue? Draw the SN curve for :
 - i) a material that displays a fatigue limit.
 - ii) a material that does not display a fatigue limit. (08 Marks)
- b. Define Creep deformation. Explain the different stages of creep with neat sketch. (08 Marks)

Module-2

- 3 a. Explain the Interstitial and Substitutional solid solution with at least two examples. (06 Marks)
- b. With neat sketch explain Cored structure and Homogenization. (04 Marks)
- c. Two metals A & B having melting points of 800°C and 1100°C respectively form an eutectic alloys at 500°C, with an eutectic composition of 65% B and 35% A. They have unlimited liquid solubilities. The solid solubility of B in A are 12% at Eutectic temp and 6% at room temperature. The solid solubilities of A in B are 10% at Eutectic temperature and 5% at room temperature. Draw the complete phase diagram and label all the fields. Determine the number, type and relative amount phases present at room temperature for an alloy 30% B and 70% A. (06 Marks)

OR

- 4 a. Draw the Iron – Carbon equilibrium diagram, indicating all temperatures, compositions and phases. Briefly explain uses of this diagram. (08 Marks)
- b. What is a Plain Carbon Steel? Discuss the transformation of eutectoid steel with slow cooling. (08 Marks)

Module-3

- 5 a. Draw CCT diagram and explain briefly for plain carbon eutectoid steel. (08 Marks)
- b. With neat sketch, explain Recovery, Recrystallization and grain growth effect on mechanical properties of metal, when cold work metal heated into temperature range of recrystallization. (08 Marks)

OR

- 6 a. Give the concept of Hardenability? What are the factors affecting hardenability? (06 Marks)
- b. With neat sketch, explain carburizing process. (06 Marks)
- c. Explain the composition, properties and uses of Malleable iron, steel. (04 Marks)

Module-4

- 7 a. Define the polymeric materials and its applications : (04 Marks)
i) Plastics ii) Elastomers. (08 Marks)
b. With neat sketch, explain Injection molding process for thermoplastics. (04 Marks)
c. Write a note on Mechanical behavior of Ceramics.

OR

- 8 a. Define Ceramic Material. Describe two methods for preparing ceramic raw materials for processing. (08 Marks)
b. What are the properties and applications of Piezo electric material? (04 Marks)
c. What are characteristics and properties of Shape memory alloys? (04 Marks)

Module-5

- 9 a. Define Composite. Give brief classification of composites. (05 Marks)
b. With neat sketch, explain the production of MMC by any one of the process. (07 Marks)
c. What are advantages and disadvantages of composites? (04 Marks)

OR

- 10 a. Discuss the roles of matrix and reinforcement material in composite material. (08 Marks)
b. A continuous and aligned glass – fiber reinforced composite having a modulus of elasticity 30 GPa. If 40% of the volume occupied by glass fiber and 60% of the composite occupied by polyester resin with modulus elasticity 3.4 GPa. Determine modulus of elasticity of glass fiber. (08 Marks)
