

1129  
M. Tech. (Micro-Electronics)  
First Semester  
MIC-106: Material Science and Engineering

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- a) What is the difference between brass and bronze?
- b) Define Grain and Grain boundaries.
- c) What are cermets?
- d) Why annealing is required in crystal preparation?
- e) What are degenerate semiconductors? (5x2)

UNIT – I

- II. a) Calculate the difference in packing densities of FCC and Zinc blende structures.  
b) Discuss point defects. What will be effect of substitutional impurities on electronic activity of the material? (2x5)
- III. a) What happens if the mixture of two materials with different thermal expansion coefficients is cooled down?
- IV. b) What are the cardinal rules of creating hetero-structures? What will be the interface quality when two materials are having high misfit factor? (2x5)
- V. a) How the ductile and brittle behaviour of engineering materials can be understood with Stress-strain diagram?  
b) A material is bombarded with the highly energetic ions. What can be the processes to remove crystal imperfections occurred? (2x5)

UNIT – II

- VI. a) What is the significance of TTT diagram? Draw TTT diagrams for eutectoid, hypo-eutectoid and Hyper-eutectoid steels. What are the effects of carbon on TTT diagram?  
b) Discuss the construction of phase diagrams using cooling curves.

(2)

VII. a) What is the significance of polymers matrix material in fibre-reinforced composites? Explain briefly.

b) How the carrier concentration of a material is dependent on the ambient temperature? What happens to the generation and recombination process if the temperature is suddenly raised? (2x5)

VIII. a) How the materials for optical devices are chosen? How the percentages of AlN in GaN alloy changes the wavelength of light emitted?

b) How direct and indirect band gap materials are useful in fabrication of different electronic devices? Discuss Photon and Phonon emissions. (2x5)

x-x-x