ROLL NO. _____

Code: AE58/AE106 **Subject: MATERIALS & PROCESSES**

AMIETE – ET (*CURRENT & NEW SCHEME*)

DECEMBER 2015

Time: 3 Hours **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. If the radius of an atom in a simple cubic crystal is r ,the body diagonal of unit cell is
(A) r√3 **(B)** 2r√3
(C) 4r/√3 **(D)** 3r/4

b. The tetragon has
(A) 4 face **(B)** 12 edges
(C) 6 corners **(D)** 8 edges

c. Hydrogen bonds are stronger than
(A) van der Waals bonds **(B)** ionic bonds
(C) metallic bonds **(D)** covalent bonds

d. The number of atoms along the body diagonal of the diamond cubic unit cell is
(A) 1 **(B)** 2
(C) 3 **(D)** 4

e. A Cation vacancy and an Anion vacancy in a crystal of the type AB is called
(A) Schottky defect **(B)** Frenkel defect
(C) pair of vacancies **(D)** none of these

f. The unit of the diffusion coefficient D is
(A) ms^{-2} **(B)** $m^{-2}\ s^{-1}$
(C) $m^2\ s^{-1}$ **(D)** m^2s

g. High conductivity aluminium should not have
(A) steel rod reinforcement
(B) solute atoms such as Cu, Ag and Au
(C) high dislocation density
(D) dissolved impurities.

h. The functions of an oxide layer during IC fabrication can be to
(A) mask against diffusion or ion- implant
(B) insulate the surface electrically
(C) produces a chemically stable surface
(D) All of these

i. The majority charge carriers in p-type Ge are
(A) Free Electrons **(B)** Ions
(C) holes **(D)** conduction electrons

j. The transition from the ferromagnetic to the paramagnetic state is named after
(A) Curie **(B)** Curie-Weiss
(C) Neel **(D)** Debye

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Explain Ionization Potential, Electron Affinity and Electronegativity. **(4+2+2)**

b. Explain secondary bonding and variation of bonding character and properties. **(8)**

Q.3 a. Explain crystalline and non-crystalline states of solids. **(8)**

b. Explain point imperfection in elemental crystals. **(8)**

Q.4 a. Explain Fick's law of Diffusion in solids. **(6)**

b. Explain Atomic model of diffusion. **(10)**

Q.5 a. Explain phenomenon of polarization in dielectric materials. **(6)**

b. Explain properties of ferroelectric materials using suitable example. **(10)**

Q.6 a. Explain hysteresis in magnetic materials. **(8)**

b. Explain soft and hard magnetic materials. **(8)**

Q.7 a. Compare conductors, semiconductors and insulators based on energy band diagrams. **(6)**

b. What is Hall effect? Derive expression for Hall Voltage and Hall Coefficient. **(2+4+4)**

Q.8 Write short notes on the following: **(4x4)**
(i) Varactor diode
(ii) Avalanche breakdown
(iii) Ferrite Core Inductor
(iv) Ferreed Relay

Q.9 Explain the following: **(2x8)**
(i) Fabrication of Junction Transistor
(ii) Operation of JFET with high drain voltage