AMIETE – ET (Current & New Scheme)

Time: 3 Hours   **June 2019**   **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. Materials which lack permanent magnetic dipoles are called
   (A) Diamagnetic   **(B)** Ferromagnetic
   (C) Semi-magnetic   **(D)** None of these

b. Which of the following is not a permanent magnetic material?
   (A) Chromium Steel   **(B)** Silicon iron
   (C) Cobalt Steel   **(D)** Alnica

c. Voltage dependent resistors are usually made from?
   (A) Graphite   **(B)** Charcoal
   (C) Silicon Carbide   **(D)** Nichrome

d. Materials which can store electrical energy are called
   (A) Magnetic materials   **(B)** Dielectric materials
   (C) Semi conductor   **(D)** Super conductor

e. The dielectric strength of ferroelectric materials depends to a large extent on
   (A) Intensity of electric field
   (B) Presence of magnetic material in the vicinity
   (C) Area of hysteresis loop for the material
   (D) Frequency of applied voltage

f. In ferromagnetic materials
   (A) The atomic magnetic moments are antiparallel and unequal
   (B) The atomic magnetic moments are parallel
   (C) The constituent is iron only
   (D) One of the constituent is iron

g. In P-N Junction, the region containing the uncompensated acceptor and donor ions is called
   (A) Transition zone   **(B)** Depletion region
   (C) Neutral region   **(D)** Active region

h. Non Linear resistors
   (A) Result in non uniform heating   **(B)** Follow ohms law at low temperatures only
   (C) Produce harmonic distortion   **(D)** None of these

i. Materials having a high dielectric constant, which is non linear are known as
   (A) Ferroelectric material   **(B)** Elastomers
   (C) Super dielectric   **(D)** Hard Dielectric

j. Which one of the following is a unipolar device?
   (A) FET   **(B)** P-N diode
   (C) Zener diode   **(D)** None of these

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

Q.2 a. Define the following terms: **(8)**
         (i) Crystal structure   (ii) Body-centered cubic structure
         (iii) Face-centered cubic structure   (iv) Hexagonal close-packed structure

         b. Explain the Powder Method for determination of crystal structure and also give its
             advantages.   **(8)**

Q.3 a. State how slip occurs in crystals? Identify the four types of bulk defects.   **(8)**

         b. Explain the structure of silica and silicates. What is surface imperfection?   **(8)**

Q.4 a. What is current density in metals? How it depends on mobility of electrons?
             Calculate mobility of electrons in copper.   **(8)**

         b. Explain the following: **(4×2)**
             (i) Pipe diffusion
             (ii) Lattice diffusion

Q.5 a. Derive expression for dielectric constant of monoatomic gasses.   **(8)**

         b. What is piezoelectricity? What are different applications in which piezoelectricity is
             used. Describe materials that show piezoelectricity.   **(2+3+3)**

Q.6 a. Give four examples of soft and hard magnetic materials each along with their
             compositions.   **(4)**

         b. What are the factors that affects permeability and hysteresis loss?   **(8)**

         c. Explain ferrites and its uses in high frequency devices.   **(4)**

Q.7 a. What do you understand by conductors, semi-conductors and insulators? Classify
             different types of semi-conductors.   **(8)**

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b. The resistivity of pure silicon at room temperature is 3000 ohm-m. Calculate the intrinsic carrier density. **(4)**

c. Derive an expression of Hall Voltage. **(4)**

Q.8 a. Write short notes on, **(4×2)**
(i) Varactor diode
(ii) Ferreed Relay

b. Discuss in detail **(4×2)**
(i) Glass and glass products
(ii) Plastics

Q.9 a. Write short notes on, **(4×2)**
(i) Grown junction
(ii) Zone refining.

b. What are the advantages of the FET over a conventional bipolar junction transistor? Define pinch off voltage, trans-conductance, amplification factor and drain resistance of an FET. **(8)**