

Code: DE54

Subject: ENGINEERING MATERIALS

DiplETE – ET

Time: 3 Hours

DECEMBER 2012

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 a piece of metal is made to have a temperature gradient between its two ends, an e.m.f. is observed to exist between those ends. The above phenomenon is known as

- | | |
|--------------------|--------------------|
| (A) Thomson effect | (B) Seebeck effect |
| (C) Peltier effect | (D) Kelvin effect |

- b. Dielectric Losses due to polarization occurs in

- | | |
|-------------------------|------------------------------|
| (A) Bipolar dielectrics | (B) Non Metallic dielectrics |
| (C) Liquid Dielectric | (D) All of these |

- c. 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

- d. 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

- e. Germanium has

- | | |
|-------------------|--------------------|
| (A) Ionic Bond | (B) Covalent bond |
| (C) Metallic Bond | (D) Molecular bond |

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- f. 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
- g. Which of the following diode is designed to operate in the breakdown region?
- (A) Signal Diode (B) Power Diode
(C) Zener Diode (D) None of these
- 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. A Junction Field Effect Transistor can operate in
- (A) depletion mode only
(B) enhancement mode only
(C) depletion and enhancement modes
(D) neither depletion nor enhancement modes
- j. Material having a high dielectric constant, which is non linear are known as
- (A) ferroelectric material (B) elastomers
(C) super dielectric (D) hard dielectric

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

- Q.2** a. Name and explain the factors on which resistivity of a conducting material depends. (8)
- b. Explain temperature dependence of electrical resistivity and conductivity in conductors and semiconductors. (8)
- Q.3** a. Explain the effect of a dielectric on the behaviour of a capacitor. (8)
- b. Explain the ionic and orientational polarization. (8)
- Q.4** a. Explain the terms dielectric losses and dielectric constant. (8)
- b. What are the important requirements of a good insulating material? (8)

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- Q.5** a. Differentiate between diamagnetic, paramagnetic and ferromagnetic materials. Also give one example of each. (8)
- b. Draw B-H curve for magnetic materials used in electric machines and explain hysteresis loop. (8)
- Q.6** a. Classify the materials based on the energy band and explain them. (8)
- b. Explain the term mobility, doping, diffusion, ferroelectricity. (8)
- Q.7** a. What is a PN junction? Draw and explain V-I Characteristics of a PN junction diode. (8)
- b. Give the application and properties of silicon iron alloy and nickel iron alloy. (8)
- Q.8** a. What is the function of a relay? How they can be classified in different categories? Explain in brief. (8)
- b. What is Metal Oxide film resistor? (8)
- Q.9** a. Describe diffused junction technique of fabrication in brief. (8)
- b. Give general properties of Junction Field Effect Transistor (JFET). (8)