
DiplETE – ET (NEW SCHEME) – Code: DE54

Subject: **ENGINEERING MATERIALS**

Time: 3 Hours

JUNE 2011

Max. Marks: 100

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. Which of the following materials can be used in cable shields?
- (A) Copper (B) Aluminium
(C) Cast iron (D) Lead
- b. The relative permeability of a paramagnetic substance is
- (A) unity (B) slightly more than unity
(C) zero (D) less than unity
- c. What type of semiconductor is selenium?
- (A) Extrinsic (B) Intrinsic
(C) N-type (D) P-type
- d. In a semiconductor the resistivity decreases with temperature in the following way
- (A) linearly (B) non-linearly
(C) exponentially (D) differentially
- e. Breakdown in a dielectric may occur due to
- (A) electrical breakdown (B) thermal breakdown
(C) electrochemical breakdown (D) all of the above
- f. Eddy currents in a core will be reduced considerably by
- (A) reducing flux density (B) laminating core
(C) reducing core volume (D) increasing the number of turns

g. Ferrites are

- (A) ferromagnetic (B) ferrimagnetic
(C) antiferromagnetic (D) diamagnetic

h. Ferro electric materials are characterised by

- (A) Very high degree of polarisation.
(B) A sharp dependence of polarisation on temperature.
(C) Non-linear dependence of the charge Q on the applied voltage.
(D) All the above.

i. Thermocouple is used for measuring

- (A) temperature (B) pressure
(C) current (D) voltage

j. When a semiconductor is doped with a P-type impurity, each impurity atom will

- (A) acquire negative charge (B) acquire positive charge.
(C) remain electrically neutral. (D) give away one electron.

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

- Q.2** a. What is thermoelectric effect? Explain the different types of thermoelectric effect. (1+9)
- b. Explain the operation of a thermocouple. (6)
- Q.3** a. Explain the effect of internal field in solids and liquids with suitable relations. (8)
- b. What is polarisation? Discuss various polarisation mechanism. (8)
- Q.4** a. Explain the phenomenon of breakdown in solid dielectrics. (8)
- b. Write properties and applications of glass and transformer oil. (8)
- Q.5** a. Explain the origin of permanent magnetic dipoles. (8)
- b. Explain ferromagnetic domains and their origin. (8)
- Q.6** a. What are solvents and etchants? (2+2)
- b. Describe the Hall effect and explain its relation to the mechanical force exerted by magnetic field on a conductor. Show that the Hall coefficient is equal to $1/Ne$ ($m^3/\text{coulomb}$). (8)

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- c. Calculate the kinetic energy of an electron in ground state of a hydrogen atom according to the theory of Bohr. (4)
- Q.7** a. Explain the construction and working of an SCR & draw its V-I characteristics. (8)
- b. Draw the characteristics of tunnel diode and compare it with a p-n junction diode. Write its applications. (8)
- Q.8** a. Explain the construction of paper capacitor and mica capacitors. (2+2)
- b. What are the different types of cores used in an inductor? Explain in brief. (6)
- c. With a diagram explain Mercury wetted relay. (6)
- Q.9** a. Give general distinguishing properties of FET's from bipolar transistors. (8)
- b. Explain the process of growing single crystal. (8)