

## DiplETE – ET (OLD SCHEME)

Code: DE04  
Time: 3 Hours

Subject: ENGINEERING MATERIALS  
Max. Marks: 100

**DECEMBER 2010**

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 half an hour 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 conducting material has least resistivity?

- (A) Silver (B) Copper  
(C) Gold (D) Aluminium

b. Super conductors have resistance upto

- (A)  $10\Omega$  (B)  $0.05\Omega$   
(C) zero (D) none of these

c. Resistivity of materials is affected by

- (A) Mechanical stress (B) alloying  
(C) temperature (D) all the above

d. Insulators have

- (A) large energy gap (B) empty conduction band  
(C) full valence band (D) all of the above

e. Dielectric constant of vacuum is

- (A) Infinite (B) 100  
(C) 1 (D) zero

f. Area of hysteresis loop represents

- (A) Copper loss (B) Eddy current loss  
(C) Hysteresis loss (D) none of these

- g. Soft magnetic materials are widely used in construction of core for
- (A) electro-magnets (B) relays  
(C) transformers (D) reactors
- h. In case of conductors, valence and conduction bands are
- (A) More distant (B) less distant  
(C) Over lapped (D) none of these
- i. Commonly used semiconducting materials are
- (A) Copper & Nichrome (B) Indium & Gallium  
(C) Silicon & Germanium (D) All of the above
- j. A P-type semiconductor is formed by addition of..... impurity to pure semiconductor
- (A) Donor (B) Acceptor  
(C) No impurity (D) None of the above

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

- Q.2** a. Explain the suitability of Copper & Aluminium that is used as electrical conducting materials. (8)
- b. Explain the effect of magnetic field on superconductors and give a few practical applications. (5+3)
- Q.3** a. Write short note on Fermi Energy and Fermi function? (8)
- b. What is dielectric loss? Which factors affects the dielectric loss? (8)
- Q.4** a. State and explain the main factors which decide the selection of an insulating material for particular purpose (8)
- b. Discuss the various properties and applications of the following insulating materials (8)
- (i) Ceramics (ii) Paper  
(iii) cotton (iv) Glass
- Q.5** a. Explain the following terms : (8)
- (i) Valence electrons (ii) Band gap  
(iii) Valence band (iv) Conduction band
- b. Explain P-N junction diode and also the V-I characteristics. (4+4)

- Q.6** a. Sketch the B-H loop of a typical ferromagnetic and define the coercivity (5)  
b. Discuss the properties of ferrites used for high frequency applications. (6)  
c. What do you mean by thermocouple? Explain (5)
- Q.7** a. Explain the following : (6)  
(i) Insulator  
(ii) Semi conductor  
(iii) Conductor
- b. Differentiate between intrinsic and extrinsic semiconductors. (6)  
c. Write short note on polymers. (4)
- Q.8** a. Discuss properties and applications of following hard magnetic materials. (6)  
(i) Tungsten steel  
(ii) Cobalt steel  
(iii) Ferromagnetic material
- b. Differentiate between soft & hard magnetic materials. (6)  
c. What do you mean by Magnetostriction in ferromagnetic material? Explain. (4)
- Q.9** a. What do you mean by resistivity ? Explain the factors affecting resistivity. (6)  
b. Explain the properties and applications of following: (4)  
(i) Carbon & Graphite  
(ii) Iron & Steel
- c. A copper wire of diameter 2 cm. had a resistance of  $0.25\Omega$ . It was drawn under pressure so that its diameter was reduced to 50%. What is the new resistance of the wire. (6)