ROLL NO. _____

Code: DE54/DE104 **Subject: ENGINEERING MATERIALS**

DipIETE – ET (Current & New Scheme)

Time: 3 Hours **DECEMBER 2016** **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. Mobility of electrons can be determined by knowing

(A) Conductivity of material **(B)** Number of free electrons
(C) Magnitude of applied field **(D)** All of these

b. The Clausius-Mossolli relation is

(A) $n\alpha/3\varepsilon_0$ **(B)** $n\varepsilon_0/3\alpha$
(C) $3n\alpha/\varepsilon_0$ **(D)** $n\varepsilon_0/\alpha$

c. Dielectric constant of gases are

(A) More than unity **(B)** Less than unity
(C) Close to unity **(D)** None of these

d. Soft Magnetic materials have a

(A) High permeability **(B)** High Resistivity
(C) High Retentivity **(D)** High Coercivity

e. If the Hall coefficient is –ve, the semiconductor is

(A) n type **(B)** p type
(C) intrinsic type **(D)** all of these

f. When Digital Volt Meter is connected across a Good SCR, it shows

(A) open circuit from cathode to anode in +ve to –ve direction
(B) open circuit from cathode to anode in -ve to +ve direction
(C) closed circuit from cathode to anode in -ve to +ve direction
(D) open circuit from cathode to anode in both direction

g. The inductor L of a coil is equivalent to

(A) $N^2\mu_0\,\mu_r/\,AL$ **(B)** $N^2\mu_0\,\mu_r L/A$
(C) $N^2/\mu_0\mu_r\,AL$ **(D)** $N^2\mu_0\,\mu_r A/L$

Where N is no of turns**,** μ_0, μ_r are absolute and relative permeability respectively, A is area and L is length of coil

h. In Depletion type JFET devices, there is

(A) Reduction of number of majority carrier available for conduction
(B) Increment of majority carrier in conducting region
(C) Both A and B
(D) None of these

i. The Air-Core inductor is having

(A) High self capacitance **(B)** Low temp coefficient
(C) Large size and cost **(D)** All of these

j. Which of the following type of inter-atomic bonding exists in a silicon atom?

(A) Ionic bonding **(B)** Metallic bonding
(C) Covalent bonding **(D)** none of these

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

Q.2 a. Explain the effect of temperature on resistivity of Material. **(6)**

b. There are about 5.9 X 10^{28} conduction electrons/m^3 in silver. Calculate the Fermi Energy. **(4)**

c. Explain the electron gas model of a metal in brief. **(6)**

Q.3 a. Explain the mechanism of Corentz field. **(8)**

b. Explain the effect of Dielectric on the behaviour of capacitors. **(8)**

Q.4 a. Explain the concept of Dielectric breakdown and how this process initiates? **(8)**

b. What are the important requirements of good insulating material? **(8)**

Q.5 a. Sketch the B-H loop of a typical ferromagnetic material and explain the characteristics of Hysteresis loop. **(8)**

b. Explain the property of Diamagnetism. **(4)**

c. The hysteresis loop of a specimen of Iron weighing 10 Kg is equivalent in area to 250 J/m^3 of iron. Find the loss of energy per hour at the rate of 50 Hz. Assume the density of iron as 7.5X 10^3 Kg/m^3. **(4)**

Q.6 a. What is doping? Explain extrinsic type semiconductor in brief. **(4)**

b. Describe the process of packaging. **(4)**

c. With the help of energy level diagram explain difference between Conductor, Semiconductor and Insulator. **(8)**

Q.7 a. What is varactor diode? Describe its construction features. **(8)**

b. Explain the process used for purification of germanium material. **(8)**

Q.8 a. Explain the construction features of following fixed type of capacitors. **(8)**
(i) Paper capacitor (ii) Mica capacitor

b. What is the role of mercury in mercury welled reed relay. List the advantages of this type of relay. **(8)**

Q.9 Write short notes on the following:
(i) Epitaxial growth of diffused junction diode **(8)**
(ii) Drain source characteristics of JFET **(8)**