ROLL NO. _____

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

DipIETE – ET (Current & New Scheme)

Time: 3 Hours **JUNE 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. Materials which can store electrical energy are called
(A) Magnetic materials **(B)** Semi conductors
(C) Dielectric materials **(D)** Super conductors

b. In *n* type semi conductor added impurity is
(A) Trivalent **(B)** Tetravalent
(C) Divalent **(D)** Pentavalent

c. Atomic weight of an atom is
(A) Sum of the number of protons and neutrons.
(B) Sum of the number of protons and electrons.
(C) Sum of the number of electrons and neutrons.
(D) Sum of the number of electrons, protons and neutrons.

d. All semiconductors in their last orbit have _____ electron.
(A) Two **(B)** Four
(C) Six **(D)** Five

e. Bronze is an alloy of
(A) Copper **(B)** Aluminium
(C) Silver **(D)** Carbon

f. Dielectric constant of vacuum is
(A) One **(B)** Two
(C) Zero **(D)** None of these

g. Resistivity of conductors is most affected by
(A) Current **(B)** Temperature
(C) Composition **(D)** Pressure

h. Plastics are
(A) Good conductors of electricity **(B)** Good conductors of heat
(C) High density **(D)** Bad conductors of electricity

i. What is the type of bonding in silicon?
(A) Metallic **(B)** Covalent
(C) Ionic **(D)** None of these

j. Hard magnetic materials are used for making
(A) Permanent magnets **(B)** Insulator
(C) Temporary magnets **(D)** Conductors

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

Q.2 a. Explain temperature dependence of electrical resistivity and conductivity in conductors and semiconductors. **(8)**

b. Give four examples of natural insulating materials. **(2)**

c. Explain the principle of a thermocouple. Give two examples of some common thermocouples. **(6)**

Q.3 a. Explain the term superconductivity. Mention its applications in electrical and electronic engineering. **(10)**

b. Classify the conducting materials. Describe their properties. **(6)**

Q.4 a. Explain dielectric loss and loss angle. **(6)**

b. What are the important requirements of a good insulating material? **(6)**

c. Explain piezoelectricity. Give examples of piezoelectric materials and applications. **(4)**

Q.5 a. Give the classification of Magnetic Materials on the basis of **(8)**
(i) M & H relationship (ii) permanent magnetic dipoles
(iii) relative permeabilities

b. What are hard magnetic materials? Name the various magnetically hard alloys. **(8)**

Q.6 a. Differentiate between n and p type semiconductors. **(8)**

b. Explain Hall Effect and give some applications of Hall Effect. **(8)**

Q.7 a. Explain P-N Junction. **(8)**

b. Write a short note on Germanium and silicon atomic structures and energy band diagram. **(8)**

Q.8 a. A 6 V / 2.5 mA relay is connected in the output stage of a transistor. The coil is made of aluminium having $\alpha = 0.005$. The resistance of the coil is 400 Ω at 77º C. Calculate the resistance of the coil at 102º C. **(8)**

b. Give the properties and applications of mica. **(8)**

Q.9 a. Write a short note on: PNP Transistor. **(5)**

b. What is meant by doping? How does it affect a semiconductor? **(3)**

c. Explain the construction of a MOSFET. Draw the symbols and diagrams of both P-channel and N-channel MOSFET. **(8)**