ROLL NO. _____

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

DipIETE – ET (Current & New Scheme)

Time: 3 Hours **June 2018** **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 lack permanent magnetic dipoles are called
(A) diamagnetic **(B)** ferromagnetic
(C) semi magnetic **(D)** None of these

b. A bipolar transistor is a _____ controlled device, whereas an FET is a _____ controlled device.
(A) current, voltage **(B)** current, current
(C) voltage, current **(D)** voltage, voltage

c. In ferromagnetic materials
(A) The atomic magnetic moments are antiparallel and unequal
(B) The atomic magnetic moments are parallel
(C) The constitute is iron only
(D) One of the constituent is iron

d. Thermionic emission occurs in
(A) Transistors **(B)** Ferrite cores
(C) Copper conductors **(D)** Semi-conductors

e. High conductivity Aluminium should have
(A) Steel rod reinforcement **(B)** Solute atoms such as Cu, Ag and Au
(C) High dislocation density **(D)** Dissolved impurities

f. In the polarization versus field strength plot for a ferroelectric crystal, Ps stands for
(A) Space charge polarization **(B)** Saturation polarization
(C) Spontaneous polarization **(D)** None of these

g. Zone refining is used for purification of
(A) conductors **(B)** insulators
(C) alloys **(D)** semiconductors

h. Dielectric material is essentially
(A) Insulating material **(B)** Conducting material
(C) Semi conducting material **(D)** Ferro-electric material

i. Which of the following materials is best for cable shields?
(A) Copper **(B)** Mica
(C) Cast iron **(D)** Lead

j. P-N junction diode is_____.
(A) a rectifier **(B)** an amplifier
(C) an oscillator **(D)** a coupler

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

Q.2 a. What is contact potential? Draw & explain the energy distribution of electrons in two metals before & after contact. **(8)**

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

Q.3 a. Explain the phenomena of polarization. **(8)**

b. Derive Clausius-Mossotti relation for dielectric constant $\in_r$ and Polarisability α. **(8)**

Q.4 a. Explain properties and application of polymers. **(9)**

b. Explain Dielectric breakdown in gasses. **(7)**

Q.5 a. What is the origin of permanent magnetic dipoles? Discuss diamagnetism and paramagnetism. **(8)**

b. Explain ferromagnetic domains and their origin. **(8)**

Q.6 a. What are the different types of semiconductor? Explain n-type and p-type semiconductor with the help of energy band diagram. **(8)**

b. Explain the following: **(4x2)**
(i) Thermal conductivity of semiconductors
(ii) Electrical conductivity of doped material

Q.7 a. What is a PN junction? Draw and explain V-I characteristic of a PN junction diode. **(8)**

b. What is junction transistor? Describe in brief the working of two types of junction transistors. **(8)**

Q.8 a. The resistance of a wire is 60 Ω at 25°C and 65 Ω at 75°C. Find the resistance of wire at 10°C and value of temperature coefficients at 0°C. **(8)**

b. What is Metal Oxide film resistor? **(8)**

Q.9 a. Explain the operation of JFET with low drain voltage and draw the drain characteristics. **(10)**

b. What is epitaxial diffused junction diode? Explain in brief. **(6)**