No. of Printed Pages : 6

OIEE-002

DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

00255

Term-End Examination

December, 2014

OIEE-002 : ELECTRICAL ENGINEERING MATERIAL

Time : 2 hours *Maximum Marks : 70*

*Note : Question no. **1** of Section A is **compulsory**. Attempt any **four** questions from Section B. All questions carry equal marks.*

SECTION A

1. Choose the correct answer. *7×2=14*

(a) Bronze is an alloy of

(i) Copper and Tin

(ii) Copper and Zinc

(iii) Copper and Aluminium

(iv) Lead and Iron

(b) For germanium, the forbidden energy gap is

(i) 0·15 eV

(ii) 0·25 eV

(iii) 0·72 eV

(iv) 1·1 eV

(c) The conductivity of a conducting material on being subjected to critical magnetic field changes to

(i) normal state

(ii) unstable state

(iii) temperature-independent state

(iv) temperature-dependent state

(d) Which insulating material is used to protect underground cables ?

(i) Bitumen

(ii) Cotton

(iii) Quartz glass

(iv) Polystyrene

(e) Capacitors to be used at high frequencies, require a material whose loss angle is

(i) low

(ii) high

(iii) uniform

(iv) one

(f) An example of a liquid conducting material is

(i) Mercury

(ii) Iridium

(iii) Silicon Resin

(iv) Boiling Sodium

(g) Material used for high speed reading and storing of information in a computer is

(i) Ferrites

(ii) Piezoelectrics

(iii) Pyroelectrics

(iv) Ferromagnetics above 768°C

SECTION B

*Attempt any **four** questions.*

2. (a) Name the different physical properties of materials. Explain how these physical properties are utilized in different fields of application. 7

(b) Explain briefly the following mechanical properties of metals : 7

(i) Elasticity

(ii) Plasticity

(iii) Fatigue

3. (a) On the basis of electron theory, derive

(i) Ohm's law in the form $\sigma = \frac{ne^2\tau}{m}$ where the symbols have their usual meanings.

(ii) Show that the heat developed per m^3 per sec in a conductor carrying a current as a result of an applied field E is given by $W = \sigma E^2$. 7

(b) What is superconductivity ? Explain how Type I and Type II superconducting materials are different from each other. 7

4. (a) With reference to dielectric breakdown of solids explain

(i) Frohlich's theory

(ii) Von Hippel theory 7

(b) What do you understand by the terms 'dielectric loss' and 'loss angle' ? Explain your answer with the help of phasor diagram. 7

5. (a) State the factors influencing the characteristics of insulating systems. Name some important gases used as insulators. Mention their applications. 7

(b) What insulating materials would you suggest for the following ? Also give the reasons.

(i) Overhead power lines

(ii) Wires and cables for lighting and power circuits 7

6. (a) Define hysteresis in ferromagnetic materials. Draw a hysteresis loop for a ferromagnetic material. Indicate on it (i) residual flux density, (ii) saturation induction and (iii) coercive force. 7

(b) Briefly explain the phenomenon of Magnetostriction and Magnetic resonance. 7

7. Write short notes on any ***two*** of the following : *2×7=14*

(a) Atomic bonding in solids

(b) Breakdown mechanism in gaseous dielectrics

(c) Modern trends in electrical insulators

(d) Origin of permanent magnetic dipole