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OIEE-002

DIPLOMA IN ELECTRICAL ENGINEERING

00773 **(DELVI)**

Term-End Examination

December, 2016

OIEE-002 : ELECTRICAL ENGINEERING MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Symbols used have their usual meaning.*

1. Derive the expression for the power dissipated per cubic metre per second in a conductor carrying a current density J as a result of an applied electric field E. *14*

2. What is superconductivity ? Draw the curve of resistivity vs temperature for normal metal and pure superconductor. Discuss the effect of the magnetic field on superconductor. *14*

3. Show that a semiconductor has a minimum conductivity at a given temperature where $n_c = n_i\sqrt{\frac{\mu_n}{\mu_c}}$ and find the minimum value of conductivity. Also find the minimum conductivity for germanium at a temperature given that $n_i = 2{\cdot}5 \times 10^{19}/m^3$, $\mu_c = 0{\cdot}38\ m^2/v\text{-}s$ and $\mu_n = 0{\cdot}19\ m^2/v\text{-}s$. *14*

4. Name the conducting materials used in making the following (Give reasons for your answer) : $4 \times 3\frac{1}{2} = 14$

   (a) Overhead transmission line

   (b) Starter elements used in starting d.c. motors

   (c) Heating elements of irons

   (d) Brushes for electrical machines

5. What is meant by dielectric strength ? With the help of a neat sketch of the apparatus used for testing of transformer oil, explain the method of determining the dielectric strength of the transformer oil. *14*

6. Define the term 'Polarisation'. Discuss ionic and electronic polarisation. Also draw the curve showing the dependency of polarizability on the frequency of the applied alternating electric field. *14*

7. (a) What are domains in ferromagnetic materials ?

(b) Give an account of the origin of permanent magnetic dipoles in matter. *7+7=14*

8. Write short notes on the following : *2×7=14*

(a) Various important properties of insulating materials

(b) Dielectric breakdown mechanism in gases