Reg. No. | | | | | | | | | | | | |

**Question Paper Code : 52093**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Second Semester**

**Civil Engineering**

**PH 2161/PH 23/080040002 – ENGINEERING PHYSICS – II**

**(Common to all branches)**

**(Regulations 2008)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. Write down the expression for Fermi-Distribution function.

2. Give the expression for the carrier concentration in metals.

3. Compared with Gemanium, Silicon is widely used to manufacture the elemental device. Why ?

4. Draw the graph for variation of Fermi level with temperature in p-type semiconductor.

5. What is the origin of magnetic moment ?

6. What are cryotron switches ?

7. Calculate the polarization produced in a dielectric medium of dielectric constant 6 when it is subjected to an electric field of 100 V/m. (Given $\varepsilon_0 = 8.85 \times 10^{-12}$ $Fm^{-1}$)

8. Define dielectric breakdown and dielectric strength.

9. What is shape memory effect ?

10. What are the different crystalline forms of carbon ?

## PART – B (5 × 16 = 80 marks)

11. (a) (i) State the postulates of classical free electron theory and derive an expression for thermal conductivity of metals. **(12)**

(ii) A copper wire whose radius is 0.08 cm carries a steady current of 10 A. Calculate the current density of the wire and drift velocity of the free electron. ($n = 8.46 \times 10^{28}/m^3$). **(4)**

**OR**

(b) (i) Derive an expression for the number of allowed states per unit volume of a solid. **(8)**

(ii) Prove that the average energy of a free electron in metal is $3\ E_{FO}/5$. **(8)**

12. (a) (i) Assuming the Fermi-Dirac distribution, derive an expression for the concentration of electrons per unit volume in the conduction band of an intrinsic semiconductor. **(12)**

(ii) Find the intrinsic carrier concentration and Position of Fermi energy level I in Silicon with respect to the VB edge. Given $m_h = 0.92\ m_0$; $m_e^* = 0.49\ m_0$. $N_C = 2.21 \times 10^{25}\ /m^3$ and $N_V = 8.60 \times 10^{24}/m^3$ and T = 300 K. **(4)**

**OR**

(b) (i) With neat sketches, explain how Fermi level varies with impurity concentration and temperature in both p-type and n-type semiconductors. **(8)**

(ii) What is Hall effect ? Describe an experimental arrangement to measure the Hall co-efficient. **(8)**

13. (a) Explain domain theory of ferromagnetism.

**OR**

(b) Mention the difference between soft and hard superconductors. Describe principle and working of SQUID and Cryotron.

14. (a) Explain about :

(i) Electronic Polarisation, Ionic Polarisation. **(8)**

(ii) Dielectric breakdown **(8)**

**OR**

(b). Derive an expression for the internal field in a dielectric and hence obtain the Clausius-Mosatti equation. **(16)**

15. (a) (i) What are metallic glasses ? Explain how they are prepared by rapid quenching method. **(2 + 6)**

(ii) List out the applications of metallic glasses. **(4)**

(iii) Explain what are the uses of shape memory alloys. **(4)**

**OR**

(b) (i) What is fullerene ? **(2)**

(ii) What are the applications of Carbon nAnotubes ? **(4)**

(iii) Explain with necessary diagrams, the synthesis of nanomaterials using the following methods :

(1) Chemical Vapour deposition **(5)**

(2) Sol-gel method. **(5)**

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