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

Question Paper Code : 31683

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Second Semester

Civil Engineering

PH 2161/PH 23/080040002 — ENGINEERING PHYSICS — II

(Common to all branches)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Wiedemann-Franz Law.
2. The fermi energy of silver is 5.51 eV. What is the average energy of a free electron at OK?
3. What is Hall effect in semi conductors?
4. Determine the number density of donor atoms which have to be added to an intrinsic semi conductor to produce an n-type semi conductor of conductivity $5\Omega^{-1}cm^{-1}$. Given the mobility of electrons $= 3850 m^2 v^{-1} s^{-1}$.
5. What are paramagnetic materials?
6. The magnetic field intensity in T in is zero at $3.69k$ and $3\times10^5/4\pi$ at ok. Calculate the temperature of the superconductor if the field intensity is measured as $2\times10^5/4\pi$.
7. Define space charged polarization.
8. What is pyroelectricity?
9. Define shape memory effect.
10. What are carbon nanotubes?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Starting with the classical free electron theory of metals obtain an expression for electrical and thermal conductivities. (12)

(ii) What are the draw backs of classical free electron theory of metals. (4)

Or

(b) (i) Define fermi distribution function. (4)

(ii) Starting with the density of energy states obtain an expression for the fermi energy of an electron at OK and hence obtain the expression for the average energy of the electron. (12)

12. (a) (i) Obtain an expression for the electrical conductivity in an intrinsic semi conductor and hence show how will you determine the band gap E_g of an intrinsic semi conductors. (8 + 4 = 12)

(ii) Find the resistance at $300k$ of an intrinsic Ge rod which is 1 cm long, 1 cm wide and 1 cm thick. The intrinsic carries density at $300k$ is $2.5 \times 10^{19}\ m^{-3}$ and mobilities of electron and hole are 0.39 and 0.19 $m^2 v^{-1} s^{-1}$ respectively. (4)

Or

(b) (i) Derive the expression for carrier concentration in an N-type semi conductor and explain how the carrier concentration varies with temperature. (8 + 4 = 12)

(ii) In a P type, semi conductor at $T = 300k$, the fermi level lies $0.4eV$ above the valance band. If the concentration of the acceptor atoms is doubled, find the new position of the fermilevel. (4)

13. (a) Explain the ferro magnetic domain theory in detail and discuss how will you account the hysteresis phenomenon. (12 + 4 = 16)

Or

(b) Write notes on :

(i) Type I and Type II superconductors. (4 + 4 = 8)

(ii) High T_C super conductors with their applications. (8)

14. (a) (i) Discuss electronic and ionic polarizations with examples. (4)

(ii) Obtain an expression for the above polarization. (6 + 6 = 12)

Or

(b) Starting with the internal field expression obtain the Clausius Mosotti equation in a dielectric. (16)

15. (a) (i) What are metallic glasses? Describe the properties of metallic glasses. (8)

(ii) How will you produce carbon nanotubes? Discuss any two methods briefly. (8)

Or

(b) (i) What are shape memory alloys? Discuss the applications of SMA's (8)

(ii) Describe the method of producing nanomaterials by Sol – gel process and electro deposition process. (4 + 4 = 8)
