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

Question Paper Code : X21072

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Second Semester

Civil Engineering

PH 6251 – ENGINEERING PHYSICS – II

(Common to all Branches)

(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Define mobility of electrons.
2. Fermi temperature of a metal is 24600 K. Calculate the Fermi velocity of electrons.

   Given k = 1.38×10^{-23} JK^{-1}, m = 9.1×10^{-31} kg.
3. Calculate the electrical conductivity of silicon at room temperature doped with 5×10^{16} phosphorous atoms/cm^3. Assume that all the impurities are ionized at room temperature. (Mobility of electrons and holes in silicon are 1350 cm^3/Vs and 450 cm^3/Vs respectively).
4. The Hall effect experiment is performed to determine the mobility of holes in a p-type silicon. The resistivity and thickness of the sample are 2.0×10^5 Ω cm and 2 mm respectively. For an applied magnetic field of 0.1 T and current of 5 μ A, the measured Hall voltage is 30 mV. Find the mobility of holes.
5. Compare Para and ferromagnetic materials.
6. What is SQUID and mention its uses ?
7. How does a dielectric material find its application in gas lighters ?
8. Calculate the electronic polarizability for argon atom. Given $\varepsilon_r = 1.0024$ at NTP and N = 2.7×10^{25} m^{-3}.
9. What are shape memory alloys ?
10. How does the electrical properties of a material changes when they are reduced to nano dimension ?

PART – B **(5×16= 80 Marks)**

11. a) Derive the expression for electrical and thermal conductivities of a metal, hence obtain the expression for Wiedemann-Franz law. **(6+6+4)**

(OR)

b) Define density of energy states. Derive the expression for the density of energy states in metals. **(2+14)**

12. a) Obtain an expression for density of holes in the valence band of p-type semiconductor. **(16)**

(OR)

b) What is Hall effect ? Derive an expression of Hall co-efficient. Describe an experimental setup for the measurement of Hall co-efficient. **(2+8+6)**

13. a) i) Define the terms orbital magnetic moment, spin magnetic moment and Bohr magneton. **(6)**

ii) Explain the hysteresis property exhibited by ferromagnetic magnetic materials using domain theory. **(10)**

(OR)

b) i) Explain the important properties exhibited by superconductors. **(12)**

ii) Explain the principle of magnetic levitation. **(4)**

14. a) i) Derive an expression for the Lorentz field developed inside a dielectric material when it is placed in a electric field. **(12)**

ii) Explain any two important dielectric breakdown mechanism. **(4)**

(OR)

b) i) Explain the phenomenon of ferroelectricity. Explain the ferrroelectricity properties exhibited by $BaTiO_3$ crystal. **(12)**

ii) How does a dielectric material behave when it is placed in a A.C. Field ? **(4)**

15. a) i) What are the properties exhibited by nanomaterials ? Explain any one method of preparing nanomaterials. **(8)**

ii) What are biomaterials ? Give the applications of biomaterials in ophthalmology and dentistry. **(8)**

(OR)

b) i) What are shape memory alloys ? Give their characteristic properties and applications and dentistry. **(8)**

ii) Explain different kinds of shape memory effect with schematic diagram. **(8)**

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