Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 21444

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023

Second Semester

Aeronautical Engineering

PH 3205 – APPLIED PHYSICS

(Regulations 2021)

Time : Three hours
Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the postulates of classical free electron theory?

2. Differentiate between actual mass and effective mass of an electron.

3. Differentiate between direct and indirect bandgap semiconductors.

4. Define Hall effect.

5. Define ionic polarization in dielectrics

6. Electronic polarization occurs in almost all frequencies, why?

7. Distinguish between soft and hard magnetic materials.

8. Mention any four properties of a superconductor.

9. Define refractive index.

10. What is the principle of luminescence?

PART B — (5 × 16 = 80 marks)

11. (a) (i) List out the basic assumptions of classical free electron theory. Deduce a mathematical expression for electrical conductivity and thermal conductivity of a conducting material. (12)

   (ii) The electrical conductivity of copper at 27°C is $5.82 \times 10^7 \ \Omega^{-1}m^{-1}$. Its thermal conductivity at 27°C is 387 $Wm^{-1}K^{-1}$. Calculate Lorentz number. (4)

Or

(b) Explain the concept of density of energy states. Derive an expression for density of electron states in a metal and based on that calculate carrier concentration in metals. (16)

12. (a) Derive an expression for the carrier concentration of an intrinsic semiconductor, explain the variation of Fermi energy with temperature and carrier concentration in the intrinsic semiconductor. (16)

Or

(b) What is Hall effect? Obtain an expression for Hall coefficient. Explain the experimental setup used to find Hall coefficient and give its applications. (16)

13. (a) Discuss in detail the different types of polarization mechanisms in dielectric and sketch their dependence on the frequency of applied electric field. (16)

Or

(b) (i) What is meant by local field? Obtain expression for the same and hence derive Clasius–Mosotti equation. (12)

(ii) Explain the ferroelectric behaviour of KDP. (4)

14. (a) Discuss about the different energies associated with the formation of domain structure in ferromagnetic materials. Also explain in brief the hysteresis phenomena exhibited by ferro magnetic materials by using domain theory. www.EnggTree.com (16)

Or

(b) (i) Distinguish between type I and type II superconductors (8)

(ii) Describe any two applications of superconductors. (4)

(iii) Prove that superconductor is a perfect diamagnet. (4)

15. (a) What are Non-Linear Optical materials? How do, non-linear optical materials function? What's phase matching in NLO materials and how it can be achieved? (16)

Or

(b) (i) Explain the principle and working of light emitting diode. (8)

(ii) What is electro optic effect? Explain the working of electro optic modulators and mention its uses. (8)

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