D 4529

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Annual Pattern — First Year

(Regulation 2004)

Aeronautical Engineering

PH 1X01 — ENGINEERING PHYSICS

(Common to All Branches)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define (a) Magnetostriction effect and (b) Piezo-Electric effect.

2. Write a note on SONAR.

3. What is known as Numerical Aperture?

4. Differentiate between active and passive fiber-optic sensors.

5. Define Wiedmann-Franz Law.

6. Outline the drawbacks of classical free electron theory.

7. Define Fermi energy.

8. The resistivity of an intrinsic semiconductor is 4.5 ohm-m at 20°C and 2.0 ohm-m at 32°C. Find the energy band gap in eV. (Boltzmann constant $= 8.617 \times 10^{-5}$ eV/K)

9. Write a note on Nano materials.

10. Write a note on Bio-materials.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define reverberation time. (2)

(ii) Derive Sabine's formula for the reverberation time. (14)

Or

(b) (i) Define Packing factor. (2)

(ii) Deduce the c/a ratio and packing factor for HCP structure. (10)

(iii) Calculate the inter-planar spacing for (101) and (221) planes in a simple cubic lattice whose lattice constant is 0.42 nm. (4)

12. (a) (i) Explain how the wavelength of monochromatic source of light can be experimentally determined using a Michelson's Interferometer. (8)

(ii) Distinguish between (1) circularly polarized light and unpolarised light and (2) elliptically polarized and partially polarized light. (8)

Or

(b) (i) Explain the lasing schemes and working of a Nd:YAG laser. (8)

(ii) Explain the construction and working of a CO_2 Laser. (8)

13. (a) (i) Define Compton effect. (2)

(ii) Derive an expression for the wavelength of the scattered photon (Compton Shift). (10)

(iii) Find the change in wavelength of an X-ray photon when it is scattered through an angle of 135° by a free electron. (4)

($h = 6.63 \times 10^{-34}$ J – s ; $m_0 = 9.1 \times 10^{-31}$ kg ; $C = 3 \times 10^8$ m/s)

Or

(b) Derive an expression for the density of energy states and carrier concentration in a solid material (Metal) by using the Fermi distribution function. (16)

(a) (i) Define Hall Effect. (2)

(ii) Explain in detail how Hall coefficient can be determined experimentally. (10)

(iii) The donor density of an n-type germanium sample is $10^{21}/m^3$. The sample is arranged in a Hall experiment having magnetic field of 0.5 tesla and the current density is 500 Ampere/m^2. Find the Hall voltage if the sample is 3 mm wide. (4)

Or

(b) Write a note on :

(i) Meissner Effect. (4)

(ii) Type I and Type II Superconductors. (4)

(iii) High T_c Superconductors. (4)

(iv) Applications of Superconductors. (4)

(a) Derive an expression for Internal field and deduce the Clausius Mosotti equation. (16)

Or

(b) (i) Write a note on Liquid Penetrant method of NDT. (4)

(ii) Explain in detail the Ultrasonic method of flaw detection with a suitable experimental system (block diagram). (12)
