

**T 8305**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Second Semester

Electronics and Communication Engineering

PH 1154 — PHYSICS — II

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name any four properties of charged particles in electron ballistics.
2. Photoelectric threshold of metallic copper is at  $\lambda = 3000 \text{ \AA}$ . Find out
  - (a) the work function of the metal and
  - (b) the maximum kinetic energy of the photoelectrons ejected, when ultraviolet light of  $\lambda = 2536 \text{ \AA}$  falls on the metal surface.
3. What are “recombination centres” and “diffusion of charges”?
4. What are the electrical properties of Ge and Si materials?
5. Distinguish between polar dielectrics and non-polar dielectrics.
6. Distinguish between fluorescence and phosphorescence.
7. What are various cubic ferrites? Give examples.
8. In a magnetic material the field strength is found to be  $10^6$  ampere/m. If the magnetic susceptibility of the material is  $0.5 \times 10^{-5}$ , calculate the intensity of magnetisation and flux density in the material.
9. What are the main advantages of IC's?
10. Define LSI circuits.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the relation for force on charged particles in an electric field. (6)
- (ii) What are the results obtained during motion of electron in parallel electric and magnetic fields? (6)
- (iii) Two parallel plates A and B are separated by a distance 3 mm and the potential difference between A and B is 200 V. Calculate the time taken by the electron to travel from plate A to plate B. (4)

Or

- (b) (i) Differentiate between
- (1) mobility and conductivity
- (2) bound and free electrons. (4)
- (ii) Derive an expression for density of states for a metal. (8)
- (iii) Discuss the energies of thermionically emitted electrons. (4)
12. (a) (i) Explain “conduction current” and “diffusion current” in semiconductors and derive an expression for each. (8)
- (ii) Derive an expression for carrier concentration in intrinsic semiconductor. (8)

Or

- (b) (i) Derive the equation of continuity for *p*-type semiconductor. (7)
- (ii) Distinguish between Type I and Type II super conductors. (7)
- (iii) A semiconducting crystal 12 mm long, 5 mm wide and 1 mm thick has a magnetic flux density of 0.5 wb/m<sup>2</sup> applied perpendicular to largest faces. When a current of 20 mA flows lengthwise through the specimen the voltage measured across its width is found to be 37 μV. What is Hall coefficient of that semiconductor? (2)
13. (a) (i) Explain ionic polarisation mechanism for a dielectric material. (6)
- (ii) Explain the frequency and temperature effects on polarisation. (6)
- (iii) Mention any six properties of ferroelectric materials. (4)

Or

- (b) (i) What are the optical properties of semiconductors. (6)
- (ii) Distinguish between direct bandgap and indirect bandgap semiconductors. (6)
- (iii) An insulating material is kept inside the parallel plate capacitor. The distance between the plates is 1 mm and the area of each plate is  $10^4 \text{ mm}^2$ . The resistivity, relative permittivity and power factor ' $\tan \delta$ ' are  $10^{10} \text{ ohm.m}$ , 8 and 0.1 respectively. Calculate the dielectric loss for d.c and a.c voltage of magnitude 1 kV. The power frequency is 50 Hz. (4)
14. (a) (i) Explain the hysteresis curve on the basis of domain theory. (6)
- (ii) Distinguish between soft and hard magnetic materials. (6)
- (iii) What are the properties of para and diamagnetic materials? (4)

Or

- (b) (i) Describe the magnetic floppy disk and hard disk memory storage device. (8)
- (ii) Explain magnetic bubble storage device with neat diagram. (8)
15. (a) (i) Describe the Bridgeman's technique for growing crystal. (6)
- (ii) Explain vapour phase epitaxial growth. (6)
- (iii) What are the steps involved in photoetching process? (4)

Or

- (b) Discuss the following :
- (i) Cathode sputtering process in thin film technology (4)
- (ii) Silk screening technology involved in thick film technology (4)
- (iii) Metal – N-type semiconductor and (4)
- (iv) Monolithic IC's. (4)