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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Second Semester

Electronics and Communication Engineering

PH 1154 — PHYSICS II

(Regulations 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Discuss the motion of electron in perpendicular electric and magnetic fields.

2. What are bound and free electrons?

3. The electrical conductivity of germanium at 20°C is 2 mho m^{-1}. What is its conductivity at 40°C? Band gap of germanium = 0.72 e V. The charge of an electron = 1.6×10^{-19} C and Boltzmann constant = 1.38×10^{-23} JK^{-1}.

4. Explain two applications of super conductors.

5. What are direct and indirect band gap semiconductors? Mention their applications.

6. Define dielectric loss. Explain its origin in dielectrics.

7. The saturation value of magnetization of iron is 1.76×10^6 A m^{-1}. Iron has body centred cubic structure with an elementary cube edge of 2.86$\overset{\circ}{A}$. Every unit cell has two atoms. Calculate the average number of Bohr magnetons contributed to the magnetisation per atom.

8. Distinguish between para and ferro magnetism.

9. Give the principle and applications of liquid phase epitaxy.

10. Mention the behaviours of metal-semiconductor contracts. How do you differentiate them based work functions of metal and semiconductors?

11. (i) Discuss the bulk crystal growth by horizontal bridgeman technique. (8)

    (ii) Give an account on the thin film resistors, diffused resistors and thick film resistors. (8)

12. (a) (i) Using classical free electron theory of metals, derive an expression for electrical conductivity. (10)

    (ii) Calculate the mobility and relaxation time of the electrons in silver. Also calculate the electron drift velocity if the field intensity in the material is 1 volt/cm. The resistivity of silver $= 1.54 \times 10^{-8}$ ohm-m. The free electron density $= 5.8 \times 10^{28}/m^3$. (6)

Or

    (b) (i) What are density of states? Using one dimensional potential well and assuming the density of states as $\left(4\pi m kT / h^3\right) \exp\left[\left(E_F - (p_x^2/2m)\right)/kT\right] d p_x$. Derive the Richardson-Dushman equation. (10)

    (ii) Discuss the choice of materials for the practical application of thermionic emission at different temperatures and voltages. (6)

13. (a) (i) Discuss the variation of charge density in the case of n-type semiconductor with respect to doping concentration and temperature. (8)

    (ii) Deduce the continuity equation and explain it with respect to semiconductors. (8)

Or

    (b) (i) Discuss the Meissner effect and isotope effect in super conductors. (8)

    (ii) What are type I and type II super conductors? Explain them with suitable examples. (8)

14. (a) (i) Discuss the different types of dielectric breakdown and their characteristics. (12)

    (ii) Discuss the frequency and temperature dependence of electronic polarisation. (4)

Or

(b) (i) Describe the construction and working of twisted nematic liquid crystal display. (12)

(ii) Distinguish between fluorescence and phosphorescence. (4)

15. (a) (i) Explain the domain theory of ferromagnetism. (12)

(ii) Using the concept of domains, explain the formation of hysteresis in ferro magnetic materials. (4)

Or

(b) (i) What are hard and soft magnetic materials? Explain their magnetic properties. (8)

(ii) Discuss the use of ferrites for making magnetic tapes and bubble memories. (8)

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