2009

M.Sc.

2nd Semester Examination

ELECTRONICS

PAPER—EL-1203

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer *Q. No. 1* and any *three* from the rest.

1. Answer any *five* questions : 2×5

(a) What is a Burgers vector?

(b) How are the Frenkel and Schottky defects formed in a crystal?

(c) The energy of an electron in a metal is quantized. Explain.

(d) Distinguish between quantum walls and dots.

(e) What is meant by complex dielectric constant?

(f) Give the principle of SQUID.

(g) Explain the concept of solitons for conduction mechanism of a polymer.

(h) What are the uses of silicon dioxide and silicon nitride in VLSI technology?

2. (a) Explain point defect with suitable diagrams.

(b) In a crystal show that the equilibrium concentration of vacancies decreases as the temperature increases. 3+7

3. (a) How is the electrical conductivity of metals described in the quantum free electron theory?

(b) Establish the Boltzman transport equation. 4+6

4. (a) Define mobility of charge carriers. Name and explain the factors which affect on the mobility.

(b) The mobility of electrons in pure GaAs at 300K is 8500 $cm^2V^{-1}s^{-1}$. Calculate the relaxation time. If the GaAs sample is doped at $N_d = 10^{17}$ cm^{-3}, the mobility decreases to 5000 $cm^2V^{-1}s^{-1}$. Calculate the relaxation time due to ionized scattering. (2+5)+(1+2)

5. (a) Explain : Superconducting ground state and superconducting energy gap. Name an experimental evidence in support of the superconducting energy gap.

(b) Why are ferrites superior to magnetic metals? In Fe_3O_4 some of the magnetic Fe^{2+} ions if are replaced by non-magnetic ions as Zn^{2+} or Cd^{2+}, the magnetization increases. Explain. (2+2+2)+(2+2)

6. Write notes on any *two* : 5×2

(a) Ferroelectricity ;

(b) Photoconductors ;

(c) High field transport.
