

M.E.T.C.E Examination 2017

(1st year,1st Semester)

PHYSICAL ELECTRONICS

The figures in margin indicate full marks. All the questions must be answered in one place. The answers should be precise.

Answer any five questions and carry equal marks

Full Marks:100

Time: Three hours

Q.1 (a) Define Hall mobility. Explain how drift mobility depends on material parameters ? 6

(b) What is the Hall voltage? How is it related to drift mobility? How Hall mobility is used for material characterisation? 8

(c) What is a compensated semiconductor? Obtain its Hall Coefficient Expression. 6

Q. 2. (a) Describe the different recombination processes in semiconductors. 5

(b) Obtain the following; (8+7)
(i) Recombination life time,
(ii) Absorption probabilities of electron and holes,
for Schokley-Read –Hall(SRH) recombination.

Q.3 (a) Obtain Einstein relation. Discuss the validity conditions for this relation. 6

(b) Derive the diffusion equation for holes . What is the significance of the relation? 8

(c) Deduce the excess carrier decay equation. 6

- Q.4 (a) Explain the concept of quasi Fermi energy. How is it significant to materials? 6
- (b) Illustrate the different carrier generation mechanisms. 6
- (c) Describe Auger band to band recombination. Give its relevance to Semiconductor optical devices. Compare it with band to band recombination for direct band semiconductor. 8
- Q. 5 (a) Deduce the expression for the following;
- (i) Surface recombination velocity 20
- (ii) Band to band recombination coefficient
- Q.6 (a) Explain the different types of traps in semiconductors. How they affect semiconducting properties ? 10
- (b) Discuss the effect of different scattering mechanisms at low and high temperatures 10
- Q.7 Obtain the Hall coefficient in a semiconductor using the Boltzmann equation in the presence of electric and magnetic fields. 20
- Q.8 Write short note on any four 5x4=20
- (i) Boltzmann Transport Equation
- (ii) Carrier generation
- (iii) Measurement of Hall coefficient
- (iv) Surface recombination
- (v) Drift and Diffusion