May 2024

B.Tech. (CE/IT/DS/CE(HINDI)/CSE(AIML)

(Second Semester)

Physics (Semiconductor Physics) (BSC-101D)

Time : 3 Hours] [*Maximum Marks :* 75

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) What are direct and indirect band gap semiconductors ? 1.5

   (b) Explain diffusion in carrier transport. 1.5

   (c) Which type of semiconductor is suitable for optoelectronic devices ? 1.5

   (d) Describe photovoltaic effect. 1.5

   (e) What is the Hall mobility ? 1.5

   (f) Explain Hot Probe with diagram. 1.5

   (g) Explain quantum dots. 1.5

(h) How many junctions are there in PN junction ? 1.5

(i) What is extrinsic semiconductor ? 1.5

(j) How to calculate band gap in UV Visible spectroscopy ? 1.5

Part B

2. (a) Define Kronig-Penney model. How does Kronig-Penney model helps in determining of energy bands ? 10

(b) How is Fermi factor dependent on temperature ? 5

3. (a) What is optical gain and optical loss in semiconductor ? 5

(b) What is an EK diagram ? What is effective mass using EK diagram ? 10

4. What are the basic assumption of Drude model and what is the derivative of thermal conductivity in free electron theory ? 15

5. (a) What is van der Pauw measurement for carrier density ? 5

(b) Define density of states. What is the density of states of a 2D semiconductor materials ? 10

6. (a) How is Schottky barrier formed in metal-semiconductor junction ? 10

(b) What is the principle of heterojunction ? 5

7. Define the following : 3×5=15

(i) Carrier recombination mechanism

(ii) Quantum wells

(iii) Stimulated emission.