Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

PIT B.Tech. (ECE)/(CSE) (Sem–1,2)

SEMI-CONDUCTOR AND OPTOELECTRONICS PHYSICS

Subject Code : BTPH-105-18

M.Code : 75363

Date of Examination : 08-06-2023

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :

a) What is E-k diagram?

b) What is effective mass?

c) At what temperature we can expect a 20% probability that electrons in silver have an energy which is 2% above the fermi energy? The fermi energy of silver is 5.5 eV.

d) Write a note on non-ohmic junctions.

e) What do you understand from carrier generation and recombination?

f) Distinguish between Spontaneous and Stimulated emission.

g) Discuss non-radiative recombination mechanism.

h) A 20 mW laser has a beam diameter of 2.2 mm. What is the intensity of the light assuming that it is uniform across the beam?

i) What are the necessary conditions for applying Van der Pauw method?

j) Laser beam spots are 1 mm and 4 mm at 1 m and 2 m distances respectively. Calculate the laser divergence.

SECTION-B

2. What are the special features of classical free electron theory of metals? Derive an expression for the thermal conductivity of a metal. Write any two drawbacks of the classical free electron theory of metals.

3. What are main assumption of quantum free electron theory? Obtain the expression for density of energy states.

4. Distinguish between extrinsic and intrinsic semi-conductors. Discuss the dependence of fermi level on temperature for n-type extrinsic semiconductors.

5. Obtain the expression for carrier concentration in p-type semiconductor.

SECTION-C

6. Explain the principle, construction and working of a homojunction semi-conductor laser with diagram. Discuss the demerits of homojunction semiconductor laser.

7. What is photo-detector? Explain the principle, construction and working of avalanche photodiode. Discuss its advantages. ,

8. What is four-point probe method? How to calculate the band gap using Four-point probe method?

9. a) How to determine the type of the semi-conductor using hot point probe method?

   b) What is Capacitance-Voltage (CV) measurement? Explain the method to determine depletion width using CV measurement.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.