R20 Regulation

Subject code: 3B1AL

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech I Semester Regular Examinations, April 2022

APPLIED PHYSICS

(ECE)

Maximum Marks: 70

Date:05.05.2022 **Duration: 3 hours**

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Explain briefly the Bloch theorem.
2 Define the Fermi level.
3 Define the terms drift and diffusion.
4 The intrinsic carrier density at room temperature in germanium is $2.37x10^{19}/m^3$. If the electron and hole mobilities are 0.38 and 0.18 $m^2V^{-1}s^{-1}$ respectively. Calculate the resistivity.
5 Classify the difference between the homo and hetero junctions.
6 Define the Photovoltaic effect and mension its importance.
7 Define the quantum well, quantum wire and quantum dot.
8 What is meant by injection electro luminescence?
9 Write any two applications of photo diodes.
10 Summarize the nagative temperature co-efficient of resistance in semiconductors.

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 a) Discuss the silent features of classical free electron theory and also mention its drawbacks.
b) Describe how the zone theory is used to classify the materials as conductors, semi-conductors and insulators. [5+5]

OR

12 a) Explain the origin of energy bands in solids.
b) Describe the concept of effective mass of an electron. [5+5]

13 a) Obtain an expression for the carrier concentration of electron in conduction band for an intrinsic semiconductor.
b) Define and explain the Hall effects with its applications. [5+5]

OR

14 a) Discuss with necessary theory the variation of Fermi level with temperature in an N-Type and P-Type semiconductor.
b) A current density of 10^3 A/m^2 flows through an N-Type germanium crystal which has resistivity 0.05 ohm-m. Calculate the time taken for electrons in material to drift a 50 μm distance. (Mobility of the electron is 0.38 m^2/V.s [7+3]

15 a) Explain about the materials for opto-electronic device applications.
b) With the suitable diagrams explain the absorption, spontaneous and stimulated emission. [5+5]

OR

16 a) Write a detail note on band gap modifications and high light its importance.
b) Explain density of states for photons. [5+5]

17 a) Differentiate the direct and indirect band gap semiconductors with suitable examples.
b) Explain the construction and working parts of a semiconductor laser diode. [5+5]

OR

18 a) Discuss the principle, working of a LED and mention its applications.
b) Indium phosphate (InP) laser diode, the wavelength of light emission is 1.55 μm. Calculate its band gap value in eV. [5+5]

19 a) Write a detail note on Photo detectors and Photo conductors.
b) Explain the working of a solar cell. [5+5]

OR

20 a) What are the characteristics of a photodetector and explain it.
b) With a neat sketch explain the Avalanche Photodiode. [5+5]