



Regulation R20

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**

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

Subject code:3B1AL

## B.Tech I Semester Supplementary Examinations, April 2023

### APPLIED PHYSICS

(Electronics and Communication Engineering)

Maximum Marks: 70

Date:10.04.2023 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 10 questions. Answer any 5 questions which carries 10M.
  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

- 1 Define relaxation time and mean free path. (10x2M=20 Marks)
- 2 What is Fermi level.
- 3 Draw the diagram of dependence of Fermi level on temperature in N-type Semi-conductors.
- 4 What is recombination?
- 5 Mention the types of Heterostructure?
- 6 Define Fermi Golden rule.
- 7 Which group semiconductors used for optoelectronic applications give examples?
- 8 Write the symbol of LED.
- 9 What is photo detector?
- 10 Explain solar cell efficiency?

#### Part-B

Answer all the questions

(5X10M=50Marks)

- 11 Explain and derive an expression for Density of states. [10]  
OR
- 12 Explain and derive an expression for Effective mass with neat diagram. [10]
- 13 a) Explain the terms Drift and diffusion and distinguish them. [5]  
b) The intrinsic carrier density at room temperature in Ge is  $2.37 \times 10^{19}/m^3$ . If the electron and hole mobilities are  $0.38$  and  $0.18 m^2 V^{-1} S^{-1}$  respectively, calculate the conductivity. [5]  
OR
- 14 a) What is Hall effect? Derive an expression for Hall Voltage? [5]  
b) Mention the applications of Hall effect. [5]
- 15 Explain the optical transitions in bulk semiconductor (absorption, spontaneous emission and stimulated emission) and deduce the relation between Einstein's coefficients. [10]  
OR
- 16 What are optical joint density states? Derive expression for optical joint density of states. [10]

- 17 a) What is the basic principle of working of LEDs. [7]  
b) Calculate the band gap energy of a semiconductor whose output wavelength is  $1.86\mu\text{m}$  in eV. [3]
- OR
- 18 What are Quantum wire based lasers? Explain. [10]
- 19 Mention the general properties of semiconductor photo detectors and explain their uses? [10]
- OR
- 20 Explain the construction and working of Avalanche Photo diode. [10]