R22 Regulation *Subject code: 4B2AN*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Semester Regular Examinations, September 2023
Applied Physics
(Common to CSE, CSE(AI&ML) and CSE(DS))

Maximum Marks: 60 *Date:22.09.2023* Duration: 3 hours

Note:
1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 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 (10x1M=10 Marks)

1 a Define de Broglie's hypothesis.

b Define Heisenberg's uncertainty principle.
c Define drift velocity.
d In which units the energy gap of Insulator is measured.
e Define Diffusion Current.
f Explain about extrinsic semiconductors.
g What are direct and Indirect band semi-conductors
h What is a dipole moment?
i What is dispersion in fiber optics?
j Explain attenuation in optical fiber.

Part-B

Answer All the following questions. (5X10M=50Marks)

2 Discuss the dual nature of matter waves. Derive an expression for the de-Broglie wavelength. Show that wavelength λ associated with an electron of mass m and kinetic energy E is given by $\lambda=h/(\sqrt{2mE})$. [10]

OR

3 Derive the time-dependent Schrodinger wave equation and explain the physical significance of the wave function. [10]

4 A) What is the density of states? Derive an expression for the density of states. [6]
B) List the postulates of Classical free electron theory. [4]

OR

5 A) Derive the equation for conductivity of metals using classical free electron theory. [6]
B) What are the differences between a metal, insulator and semiconductor. [4]

6 A) Explain Hall effect and derive an expression for Hall coefficient. [7]
B) Write the Hall effect applications. [3]

OR

7 A) Derive the expression for carrier concentration of electrons in intrinsic semiconductor. [5]
B) Explain with a neat labelled diagram the formation of PN junction. [5]

8 With the help of a neat labeled diagram, describe the construction and working of the Avalanche photodiode. [10]

OR

9 A) Explain in detail the phenomenon of Ferro electricity and its properties. [5]

B) Explain the characteristics of liquid crystal materials. [5]

10 A) Distinguish between step index and graded index fiber. [5]

B) Write a short note on quantum mechanical bit. [5]

OR

11 Obtain an expression for the numerical aperture of optical fiber. Compute the numerical aperture and acceptance angle of optical fiber with refractive index $n_1 = 1.55$, $n_2 = 1.50$, $n_0 = 1$. [10]