R22 Regulation *Subject code: 4B1AK*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech I Semester Regular/Supplementary Examinations, January 2024

Applied Physics

(Information Technology)

Maximum Marks: 60 Date: 22.01.2024 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)	CO No.	Bloom Tx
1.	a	What is Heisenberg uncertainty principle?	CO1	L1
	b	What is a matter wave?	CO1	L1
	c	Define the Fermi energy.	CO2	L1
	d	In solid, consider the energy level lying 0.01 eV above Fermi level. What is the probability of this level being occupied by an electron at 300 K?	CO2	L2
	e	Explain the importance of the doping in semiconductors.	CO3	L2
	f	Define the diffusion in semiconductors.	CO3	L1
	g	Define the working principle of a LED?	CO4	L1
	h	Define the susceptibility.	CO4	L1
	i	Write the importance of numerical aperture.	CO5	L1
	j	Define quantum logic gate.	CO5	L1

Part-B

	Answer All the following questions. (5X10M=50Marks)		
2	a) Show that the de-Broglie wave equation $\lambda = h/mv$. [5M] b) Explain the physical significance of wave function. [5M]	CO1	L3 L2
	OR		
3	Prove that the energies of a particle in a potential box are quantized. [10M]	CO1	L3
4	a) Describe the main features of a classical free electron and mention its failures. [5M] b) Explain the classifications of metals, semiconductors and insulators based on band theory. [5M]	CO2	L2 L2
	OR		
5	a) Discuss the origin of energy bands in solids. [5M] b) Explain the motion of an electron in a periodic lattice. [5M]	CO2	L3 L2

6	a) Write a short note on intrinsic and extrinsic semiconductors. [5M] b) With a neat sketch explain the formation of a PN-junction. [5M]	CO3	L1 L1
	OR		
7	a) Derive an expression for the density of electrons in conduction band of an intrinsic semiconductor. [5M] b) Define and explain the Hall Effect with its applications. [5M]	CO3	L3 L1
8	a) Differentiate the direct and indirect band gap semiconductors. [5M] b) Explain clearly the phenomenon of Ferro-electricity. [5M]	CO4	L2 L2
	OR		
9	a) With a neat diagram discuss the construction and working of an Avalanche photo diode (APD). [5M] b) Define the Photoluminescence and discuss the LCD. [5M]	CO4	L2 L2
10	a) Explain the signal transmission in step index and graded index fibers. [5M] b) Discuss the Bloch sphere representation with a neat diagram. [5M]	CO5	L2 L2
	OR		
11	a) With a neat sketch discuss the block diagram of optical fiber communication system. [5M] b) Explain the CNOT Qubit gate with truth table. [5M]	CO5	L2 L2