GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Computing Science and Engineering

Bachelor of Technology in Computer Science and Engineering
Summer Term Examination – July - August 2024

Duration : 180 Minutes
Max Marks : 100

Sem II - C1UD124B - Semiconductor and Optoelectronic Devices

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Explain the total internal reflection with ray diagram in an optical fiber and write the condition of total internal reflection	K1(3)
2)	Draw the E-K diagram of a semiconductor based on band theory of solids. Explain conduction and valence bands.	K2(4)
3)	Graphically represent the variation of energy, velocity and effective mass of electron with k. Applying the concept of negative mass, interpret the idea of hole in semiconductor.	K2(6)
4)	Can a photon and an electron of the same momentum have the same wavelengths? Compare their wavelength if the two have the same energy.	K3(6)
5)	Analyze the need of doping in the field of semiconductors. Describe the n-type and p-type semiconductors clearly explaining the term “donor” and “acceptor” using the energy band diagram.	K3(6)
6)	Discuss the photoelectric effect on the basis of Planck's quantum theory.	K3(9)
7)	Describe the characteristics of Lasers. With the help of diagram explain the principle of three level and four level lasers.	K3(9)
8)	A diode with potential barrier 0.6 V across its junction, is connected in series with resistance of 24 Ω across source. If 0.2 A current passes through resistance, calculate the source voltage. Also draw the circuit diagram and mention the biasing of the diode	K4(8)
9)	Design the forward and reversed biased circuit by connecting the ammeter and voltmeter using p-n junction diode. Analyze the I-V curve of the diode in forward and reversed biasing conditions. Why static resistance in the case of forward biasing is low?	K4(12)
10)	Locate the position of Fermi energy in extrinsic semiconductors in the band diagram and interpret the variation of Fermi level with temperature in n-type semiconductor.	K5(10)

11)	Discuss in detail the process of wafer preparation in semiconductor manufacturing, also explain the photo-masking and role of photo-resist layer.	K5(15)
	OR	
	Describe in details the lithography technique for the integrated circuit printing.	K5(15)
12)	Explain density of states in a solid. Derive the mathematical expression for density of states.	K6(12)
	OR	
	Make use of a diagram to recollect the working of Zener diodes and its forward and reverse characteristics. Also distinguish between Avalanche and Zener breakdowns.	K6(12)