Reg. No.															

Question Paper Code	12809

B.E. / B.Tech./ M. Tech - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

Computer Science and Engineering

(Common to Computer Science and Engineering (AI-ML), Computer Science and Engineering (CS), Computer Science and Engineering (IOT), Artificial Intelligence and Data Science, Information Technology & M.Tech. - Computer Science and Engineering)

20BSPH203 - PHYSICS FOR INFORMATION SCIENCE

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What are the demerits of the quantum free electron theory of solids?	2	K1	CO1
2.	The mobility of electrons in copper is $3x10^{-3}$ m^2 /Vs. Assuming e = $1.6x10^{-19}$ C and m = $9.1x10^{-31}$ kg. Calculate the mean free time.	2	K2	CO1
3.	List out the characteristics of semiconductors.	2	K1	CO2
4.	What do you understand by the term electron-hole pair?	2	K2	CO2
5.	What happens to the magnetic flux when a diamagnetic material is kept in a magnetic field?	2	K2	CO3
6.	An n-type semiconductor has a Hall coefficient, R_H = 4.16 x 10^{-14} m^3 /C. The conductivity is 108 $ohm^{-1}m^{-1}$. Calculate the charge carrier density at room temperature.	2	K2	CO3
7.	What is superconductivity?	2	K1	CO4
8.	Calculate the wavelength emitted by a semiconductor whose band gap energy is 1.44 eV.	2	K2	CO4
9.	What is a quantum dot?	2	K1	CO6
10.	Relate the size of the material with its optical absorption wavelength and band gap energy.	2	K2	CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Deduce mathematical expression for electrical conductivity and thermal conductivity of a conducting material and hence obtain Wiedemann-Franz law.	13	K2	CO1
		OR			
	b)	Derive an expression for the effective mass of an electron moving energy bands of a solid. Show how it varies with the wave vector.	13	K2	CO1

12.	a)	Derive an expression for the carrier concentration of an intrinsic semiconductor.	*13*	*K2*	*CO2*
		OR			
	b)	Obtain an expression for the carrier concentration of holes in the valence band of a p-type semiconductor.	*13*	*K2*	*CO2*
13.	a)	Discuss briefly about the classification of magnetic materials based on magnetic moment/spin alignment.	*13*	*K2*	*CO3*
		OR			
	b) i)	Draw the B-H curve (hysteresis) for a ferromagnetic material and explain the same on the basis of domain theory.	*8*	*K2*	*CO3*
	ii)	Bring out the differences between soft and hard magnetic materials.	*5*	*K2*	*CO3*
14.	a)	Describe the processes of absorption and emission of light in metals, semiconductors and insulators.	*13*	*K2*	*CO4*
		OR			
	b) i)	List out the differences between Type-I and Type-II superconductors.	*8*	*K2*	*CO4*
	ii)	Write a short note on: Isotope effect and Persistent current.	*5*	*K2*	*CO4*
15.	a)	Discuss in detail about the principle, construction and working of a Single Electron Transistor (SET).	*13*	*K2*	*CO6*
		OR			
	b)	Describe carbon nano-tubes with types of structures, properties and applications.	*13*	*K2*	*CO6*

PART - C (1 × 15 = 15 Marks)

16.	a)	What is magnetic data storage? How can one read/write data on a hard disc using a GMR spin valve?	*15*	*K2*	*CO5*
		OR			
	b)	Explain the principle, construction and working of quantum dot lasers. Also, list out the advantages, drawbacks and applications of it**.**	*15*	*K2*	*CO5*

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