Reg. No.															

Question Paper Code	12993

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Second Semester

Computer Science and Engineering

(Common to Information Technology, Artificial Intelligence and Data Science, Computer Science and Engineering (AIML), Computer Science and Engineering (IoT) and M.Tech - Computer Science and Engineering)

20BSPH203 – PHYSICS FOR INFORMATION SCIENCE

Regulation – 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Wiedemann-Franz law gives the ratio of _____ (a) Electrical conductivity and Thermal conductivity (b) Thermal conductivity and Electrical conductivity (c) Thermal conductivity and Electrical resistivity (d) Temperature and Pressure	1	K1	CO1
2.	The properties of metals that cannot be explained from the free electron gas model are: (a) Electrical Conductivity. (b) Thermal Conductivity. (c) Paramagnetic Susceptibility. (d) Optical properties of metals.	1	K1	CO1
3.	The topmost filled energy level at 0K is identified as: (a) Conduction band (b) Valance band (c) Fermi level (d) Transmission level	1	K2	CO1
4.	Based on Fermi-Dirac (FD) statistics, what is the maximum number of electrons that can occupy one energy state? (a) 2 (b) 1 (c) 4 (d) 3	1	K1	CO2
5.	Which of the following is NOT an example of a semiconductor material? (a) Silicon (Si) (b) Germanium (Ge) (c) Gold (Au) (d) Gallium Arsenide (GaAs)	1	K1	CO2
6.	Fermi energy level for intrinsic semiconductors lies (a) At middle of the band gap (b) Close to conduction band (c) Close to valence band (d) None	1	K1	CO2
7.	Fermi level for extrinsic semiconductor depends on (a) Donor element (b) Impurity concentration (c) Temperature (d) All	1	K1	CO2
8.	Amongst the materials given below which one can have both –ve and +ve Hall coefficients: (a)Metal (b)Doped semiconductor (c)Insulator (d)Intrinsic semiconductor	1	K1	CO3
9.	The ratio of the intensity of magnetization M to the magnetic field H, is known as: (a) Magnetic susceptibility (b) Magnetic permeability. (c) Magnetic field intensity. (d) Magnetic flux.	1	K1	CO3
10.	For which of the following materials, the net magnetic moment is be zero (a) Diamagnetic material (b) Ferromagnetic materials (c) Antiferromagnetic materials (d)Ferromagnetic materials	1	K1	CO3
11.	Superconductor have zero_____ (a) Resistivity. (b) Conductivity. (c) Electricity. (d) All of the above.	1	K1	CO4

12.	Metals can _____ the light beams. (a) Reflect. (b) Refract. (c) Diffract. (d) Transmit.	*1*	*K1*	*CO4*
13.	The superconducting state is perfectly _____ in nature. (a) Diamagnetic (b) Paramagnetic (c) Ferromagnetic (d) Ferromagnetic	*1*	*K1*	*CO4*
14.	Materials that transmit light with minimum absorption and reflection are known as (a) Transparent (b) Translucent (c) Opaque (d) All of the above.	*1*	*K2*	*CO4*
15.	Solar cell works based on (a) Laser technology (b) Photo-conduction (c) Thermal emission (c) Tyndall effect	*1*	*K2*	*CO5*
16.	What does OLED stand for? (a) Orange Light Emitting Diode (b) Organic Light Emitting Diode (c). Optically Linked Emitting Diode (d) Operational Light Emitting Device	*1*	*K1*	*CO5*
17.	In case of quantum confinement effect, wave function is _____ in nature. (a) Longitudinal wave (b) Transverse wave (c) Travelling wave (d) Standing wave	*1*	*K1*	*CO6*
18.	Quantum dots fall under _____ nano-material (a) One dimensional (b) Two dimensional (c) Zero dimensional (d) Three dimensional	*1*	*K2*	*CO6*
19.	A material is said to be nano-material if (a) the particles have all three dimensions in nano meter range (b) the particles have only two dimensions in nano meter range (c) at least one dimension is below 100 nm (d) none of these	*1*	*K1*	*CO6*
20.	Large scale production of CNT can be achieved (a) by arc discharge method (b) by laser vaporization method (c) in tubular furnace in presence of metal catalyst and a mixture of methane, H_2 gases (d) all of these	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	Give the postulates of classical free electron theory.	*2*	*K1*	*CO1*
22.	Compare free electron approximation and tight binding approximation.	*2*	*K2*	*CO1*
23.	Summarize the properties of semiconductor.	*2*	*K2*	*CO2*
24.	Differentiate between direct and indirect band gap semiconductors.	*2*	*K1*	*CO2*
25.	Show the magnetic dipole alignment in ferro, anti-ferro and ferri-magnetism.	*2*	*K2*	*CO3*
26.	What is Giant Magneto-resistance?	*2*	*K1*	*CO3*
27.	Distinguish between radiative and non-radiative transition.	*2*	*K2*	*CO4*
28.	Mention the merits of optical data storage.	*2*	*K1*	*CO5*
29.	State Coulombblockade effect.	*2*	*K1*	*CO6*
30.	Classify quantum confined structure.	*2*	*K2*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a) Derive an expression for thermal conductivity of electrons in metal.	*10*	*K2*	*CO1*
	OR			
	b) Write an expression by deriving the effective mass of electron and discuss the concept of hole from it.	*10*	*K2*	*CO1*

32.	a)	Draw energy level diagram for i) intrinsic semiconductor, ii) n-type semiconductor iii) p-type semiconductor.	*10*	*K3*	*CO2*
		OR			
	b)	Derive an expression for the carrier concentration of intrinsic semiconductor.	*10*	*K3*	*CO2*
33.	a)	Discuss in detail about magnetic materials classifications with its behavior.	*10*	*K2*	*CO3*
		OR			
	b)	Illustrate the hysteresis curve based on the domain concept.	*10*	*K2*	*CO3*
34.	a)	Sketch the band gap of absorption and emission of light on metal, semiconductor and insulator.	*10*	*K3*	*CO4*
		OR			
	b) i)	Explain briefly about carrier recombination in semiconductors.	*7*	*K3*	*CO4*
	ii)	Write short notes on Magnetic levitation.	*3*	*K3*	*CO4*
35.	a)	Describe the principle, construction and working of solar cells.	*10*	*K2*	*CO5*
		OR			
	b)	Discuss principle, construction, working, advantages, drawbacks and applications of OLED.	*10*	*K2*	*CO5*
36.	a)	Demonstrate the construction and working of single electron transistor.	*10*	*K2*	*CO6*
		OR			
	b)	Describe carbon nano-tubes with types of structures, properties and applications.	*10*	*K2*	*CO6*