IILM University, Greater Noida
End Semester Examination

Name:				
Enrolment No:				
	Name of the School	School of Basic and Applied Sciences	**Name of the Department**	Department of Physics
	Name of the Program	B.Tech. CSE	**Course Code/ Course Name/ Name of the faculty**	UBS1008-Physics
	Session	2024-25	**Branch, Year & Semester**	CS, 1st, 1st
	Time/Max Marks	**3 Hours/100**	**Set**	A
	Note: **1) Attempt all sections (A, B & C).** **2) Attempt all questions in section A & B.** **3) Section C consists of 5 questions. One question from each unit. Questions may have internal choice from the same unit. Attempt all questions.**			

Q No.	QUESTIONS	MARKS	CO
	SECTION-A: Attempt all the following questions in brief.		**(10x2=20)**
Q1(a)	Explain the concept of skin depth in the context of electromagnetic wave propagation. Write its mathematical expression.	2	1
(b)	Briefly discuss the concept displacement current.	2	1
(c)	Write two inadequacies of Classical Mechanics.	2	2
(d)	*Describe the tunneling effect in quantum mechanics and how it differs from classical expectations.*	2	2
(e)	Give one example of three level laser and four level laser each.	2	3
(f)	List and explain the basic components of an optical fibre.	2	3
(g)	Define superconductivity and transition temperature.	2	4
(h)	Discuss the expression for Fermi Dirac distribution function.	2	4
(i)	Write any two allotropes of carbon and describe their structure.	2	5
(j)	Give two industrial applications of nanomaterials.	2	5
	SECTION-B: Attempt all questions.		**(5x6=30)**
Q2(a)	A 1000 W sodium lamp radiating its power. Calculate the electric field and magnetic field strength at 4m from the lamp.	6	1
(b)	Determine the velocity and kinetic energy of an electron having de-Broglie wavelength 1Å. Given mass of electron = 9.1×10^{-31} kg and Planck's constant h = 6.63×10^{-34} Js	6	2
(c)	A glass fibre has a core material of refractive index 1.50, cladding material of refractive index 1.47. If it is surrounded by air, compute (i) the critical angle at the core cladding interface; (ii) numerical aperture; (iii) acceptance angle	6	3
(d)	A superconducting tin has a critical temperature of 3.7 K in zero magnetic fields and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K.	6	4
(e)	Discuss any four differences between SEM and TEM.	6	5

	SECTION-C: Attempt all questions. Attempt any one part of each question.		**(5x10=50)**
Q3(a)	State Poynting's Theorem for the flow of energy in electromagnetic waves. Derive the mathematical expression for the Poynting vector and analyse how it relates to energy flux in electromagnetic fields.	10	1
	OR		
Q3(b)	Use Maxwell equations from electrodynamics to show E and B follows the wave equation. Further show that the velocity of plane electromagnetic waves in the free space is given by $c=1/\sqrt{(\mu_0\varepsilon_0)}$.		
Q4(a)	Explain the physical significance of wave function "ψ". Derive time independent Schrödinger wave equation.	10	2
	OR		
Q4(b)	Solve Schrödinger's wave equation for a particle in one dimensional rigid box of side a, having potential energy (V) as follows: $V(x) = \infty$ for $x < 0$ and $x > a$; $V(x) = 0$ for $0 \le x \le a$		
Q5(a)	With the help of diagram describe the process of spontaneous and stimulated emission of radiation. Also obtain an expression for Einstein's coefficient of spontaneous and stimulated emission of radiation.	10	3
	OR		
Q5(b)	Classify the types of optical fibres based on their modes of propagation and index profile. Compare the characteristics of each type and explain how it affects the propagation of light within the fibres.		
Q6(a)	Discuss the formation of bands in solids and differentiate between semiconductors, conductors, and insulators.	10	4
	OR		
Q6(b)	Explain the characteristics of Type I and Type II superconductors. Discuss the important property that changes during the superconducting transition.		
Q7(a)	Using the concept of density of states (DOS), explain 0D, 1D, 2D, and 3D nanomaterials and relate the dependency of their DOS on energy with help of suitable diagram. Provide specific examples of materials in each category.	10	5
	OR		
Q7(b)	"Nanomaterials behave differently from the bulk" Explain. Discuss key properties of nanomaterials and how these properties influence their applications in modern technology.		