Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES
End Semester Examination, May 2023

Course: Physics **Semester: II**
Program: B. Tech FSE **Time : 03 hrs.**
Course Code: PHYS 1002 **Max. Marks: 100**

Instructions: Use of scientific calculator is allowed

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Differentiate between Fresnel and Fraunhofer diffraction	**4**	**CO1**
Q2	Prove that phase velocity exceeds the velocity of light.	**4**	**CO3**
Q3	A signal of power 5μW exists just inside the entrance of 0.1 km long fibre. Calculate the attenuation coefficient of the fibre if the power inside the fibre be 1 μW.	**4**	**CO1**
Q4	A particle limited to the x-axis has the wave function $\Psi = ax$ between x = 0 and x = 1; $\Psi = 0$ elsewhere. Find: (i) the probability that the particle can be found between x = 0.45 and x = 0.55. (ii) the expectation value <x> of the particle's position.	**4**	**CO3**
Q5	Distinguish between primitive cell and non-primitive cell.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q6	Explain the hysteresis curve in ferromagnetic materials.	**10**	**CO2**
Q7	An electron is trapped in a 1D infinitely deep potential well of width $L = 10^{-9}$ m. Calculate the wavelength of photon emitted from the transition $E_4 \rightarrow E_3$.	**10**	**CO3**
Q8	Deduce the relationship between Einstein's coefficients. OR Show that plane and circularly polarized lights are the special cases of an elliptically polarized light.	**10**	**CO1**
Q9	If the earth receives 2 cal $min^{-1}cm^{-2}$ solar energy, what would be the amplitudes of electric and magnetic fields of radiation	**10**	**CO2**

SECTION-C
(2Qx20M=40 Marks)

Q10	a) Derive the mathematical expression for Compton shift. (10)	**20**	**CO3**

	b) What is Heisenberg's uncertainty principle? Explain why electrons cannot reside inside the nucleus? (10) OR a) What is pair production? Explain why it cannot take place in an empty space. (10) b) Develop the time dependent Schrodinger wave equation for a quantum particle starting with simple wave equation. (10)		
Q11	a) Define photovoltaic effect. Explain the construction and working of a solar cell with its I-V characteristics. (10) b) What are Miller indices? Draw the planes (111) and (234). (10)	**20**	**CO4**

LIST OF IMPORTANT CONSTANTS

Planck's constant, $h = 6.6 \times 10^{-34}$ J.s
Boltzmann's constant, $k = 1.38 \times 10^{-23}$ J/K
Mass of electron, $me = 9.1 \times 10^{-31}$ Kg
Mass of proton, $mp = 1.67 \times 10^{-27}$ Kg
Velocity of light, $c = 3 \times 10^{8}$ m/s
Rydberg Constant, $R = 1.097 \times 10^{7}$ m-1
Avogadro's number $= 6.023 \times 10^{23}$
Permeability of free space, $\mu o = 4\pi \times 10^{-7}$ Henry/m
Permittivity of free space, $\varepsilon o = 8.85 \times 10^{-12}$ F/m

Impedance of em wave in free space $Z_o = 377$ Ohm