Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Physics **Semester: I**

Program: B. Tech APE-UP, ADE, Chemical, ME, Mech, ECE, CE, E&Com, SE, ASE **Time : 03 hrs.**

Course Code: PHYS 1002 **Max. Marks: 100**

Instructions: Use of scientific calculator is permitted.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between soft and hard magnetic materials.	**4**	**CO2**
Q 2	Draw the atomic planes described by the miller indices (123) and (112).	**4**	**CO4**
Q 3	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**
Q 4	State the characteristics of Laser. Also list their applications.	**4**	**CO1**
Q 5	If the magnitude of $\vec{H}$ in a plane wave is A/m, find the magnitude of $\vec{E}$ for plane wave in free space.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Show that plane and circularly polarized lights are the special cases of an elliptically polarized light.	**10**	**CO1**
Q 7	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**
Q 8	Derive the expression for Clausius Mossotti equation.	**10**	**CO 2**
Q 9	Derive the mathematical expression for Ampere's circuital law incorporating Maxwells correction. OR 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)

Q 10	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) OR a. What is the photoelectric effect? Explain it with the help of different graphs. . (10) b. A photon of energy E is scattered by an electron initially at rest (rest mass energy, E_0) (Compton scattering problem). Show that the maximum kinetic energy (KE_{max}) of the recoil electron can be calculated as $KE_{max}=\frac{2E^2/E_0}{1+2E/E_0}$ (10)	**20**	**CO3**
Q 11	a. Define Bravais lattice and describe their different types. (10) b. Define maximum power point, fill factor & efficiency of a solar cell. Calculate input power to obtain 0.1 watt output power from 10% efficient poly-Si solar cell. (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