Name: **Enrolment No:**	

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

Course: Electromagnetic theory — **Semester: VI**
Program: B. Sc(Hon) Physics — **Time : 03 hrs.**
Course Code: PHYS 3003 — **Max. Marks: 100**

Instructions:

S. No.		Marks	CO
	SECTION A (5Qx4M=20Marks)		
Q 1	Define Poynting vector and poynting theorem.	**4**	**CO1**
Q 2	Define refractive index, dielectric constant and wave impedance.	**4**	**CO2**
Q 3	Explain the significance of polarization	**4**	**CO1**
Q 4	Explain the role of plasma in wave propagation, with suitable examples	**4**	**CO2**
Q 5	Define numerical aperture and acceptance angle.	**4**	**CO3**
	SECTION B (4Qx10M= 40 Marks)		
Q 6	In a lossless medium for which $\eta=60\pi, \mu_r=1,$ $H=-0.1\cos(\omega t-z)a_x+0.5\sin(\omega t-z)a_y\,A/m,$ Calculate $\varepsilon_r, \omega, \wedge E$.	**10**	**CO4**
Q 7	Explain reflection through metallic surface, normal incidence.	**10**	**CO3**
Q 8	Plot and explain the reflection coefficient (TE and TM modes) Vs angle of incidence for the following cases : a) $n_1 > n_2$ b) $n_1 < n_2$ Derive the expression for Brewster's angle	**10**	**CO2**
Q 9	Distinguish the various types of optical fibers based on structure	**10**	**CO2**

	parameters and performance characteristics		
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	Derive the Fresnel's formulae for parallel polarization case with neat diagram (Explain the propagation vector, E and H directions)	**20**	**CO5**
Q 11	a) A uniform plane wave propagating in a medium has $E = 2e^{-\alpha z}\sin\left(10^8 t - \beta z\right) a_y V/m$ If the medium is characterised by $\varepsilon_r = 1, \mu_r = 20 \wedge \sigma = 3\frac{mhos}{m},$ $find\, \alpha, \beta, \wedge H.$ b) Derive a pair of time-harmonic transmission-line equations for phasors$V(z) \wedge I(z)$. or c) Explain the construction and working Babinet Compensator and its Uses. d) Two Nicol's have parallel polarizing directions so that the intensity of transmitted light is maximum through what angle must either Nicol be turned if the intensity is to drop by one fourth of its maximum	**20**	**CO5**