End-Term Examination
(CBCS)(SUBJECTIVE TYPE)(OffLine)
Course Name:<B.Tech (CSE-AI/AI&ML) , Semester:1st
(Feb-March, 2023)

Subject Code: BAS107	Subject: Applied Physics -.
Time : 3 Hours	Maximum Marks :60

Note: Q. 1 is compulsory. Attempt one question each from the Units I, II, III & IV.

Q1 (5*4=20)

(a) Explain the phenomenon of polarisation of light. Discuss the principle, construction, and working of a Nicol Prism as polarised.

(b) If the magnitude of H in a plane wave is 1 A/m, find the magnitude of E for plane wave in free space.

(c) The wave function of a certain particle is $\psi = A\cos^2 x$ for $-\pi/2 < x < \pi/2$
(i) Find the value of normalization constant A.
(ii) Find the probability that the particle be found between x=0 and x=π/4

(d) Define Single mode, Multi mode and Graded index fibres? Also expalin at least five differences in structures of single mode step index and multimode graded index fibre with labeled diagram.

UNIT-I

Q2 (a) Derive an expression for Path difference, Phase Difference, Resultant Amplitude, and conditions for maxima and minima in Fraunhofer Diffraction due to single slit? (5+5=10)

(b) Refractive index of glass is 1.5. Calculate Brewster's angle for it. Also , calculate the angle of refraction.

Q3 (a) Define plane, circularly and elliptically polarised light? Derive an expression for the production of plane, circularly and elliptically polarised light?. (5+5=10)

(b) A single slit of width 1 mm is illuminated by light of wavelength 589 nm. Find the angular spread of the central maxima of diffraction pattern observed.

UNIT-II

Q4 (a) Write down four basic Maxwell's equations in free space. Show that Electromagnetic waves are transverse in nature. (5+5=10)

(b) Determine penetration depth by which an electromagnetic wave enters into copper, if $\rho_{cu} = 1.69 * 10^{-8}$ μm and frequency = 10^4 MHz.

Q5 (a) Obtain the electromagnetic wave equations, using Maxwell's equation, in an isotropic dielectric medium and show that the speed of wave is less than its speed in vacuum. (5+5=10)

(b) In free space, H = 0.9 cos (6 *10^8t – kx)j H/m. Calculate k, λ and T.

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UNIT-III

Q6 (a) Define Phase velocity and group velocity. Give three differences between group and phase velocities of waves. Derive an expression for the relationship between phase velocity and group velocity **(5+5=10)**

(b) Calculate the uncertainty in measurement of momentum of an electron if the uncertainty in locating it is 1Å
(Given $m_e = 9.1*10^{-31}$ Kg)

Q7 **(a)** Solve the Schrodinger wave equation for a particle having mass m confined to one dimensional infinite potential box of width L in order to obtain its eigen values and show that the eigen functions are discrete. **(5+5=10)**

(b) Derive an expression for Schrödinger time independent wave equations.

UNIT-IV

Q8 (a) What is population inversion in Laser and how it is achieved? **(2+8=10)**

(b)Discuss the principle with neat construction, and energy level diagram of a He-Ne laser.

Q9 (a) Explain the basic principle used in optical fibre for transmission of light. What is acceptance angle for an optical fibre? How it is related to numerical aperture. **(5+5=10)**

(b) Find out the numerical aperture and acceptance angle of an optical fiber, if the refractive indices for core and cladding are 1.6 and 1.5 respectively.