End-Term Examination (Regular & Reappear)
(CBCS)(SUBJECTIVE TYPE)(OffLine)
Course Name: B.Tech CSE-AI, AI&ML, Semester:1st
(December, 2023)

Subject Code: BAS 107 | 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		(2.5*8=20)
	(a) How many orders will be visible if the wavelength of the incident radiation is 5000 Å and the number of lines on the grating is 2620 in one inch?	
	(b) Calculate the thickness of a soap film (μ = 1.463) that will result in constructive interference in the reflected light, if the film is illuminated normally with light whose wavelength in free space is 6000 Å.	
	(c) What is the skin depth of a conductor with conductivity 20 S /m at a frequency of 10 GHz?	
	(d) What is stokes theorem? What is the condition for an Electric field to be conservative in nature?	
	(e) An electron is bound in one-dimensional potential box, which has a width 2.5×10^{-10} m. assuming the height of the box to be infinite, calculate the lowest two permitted energy values of the electron.	
	(f) What is wave function? Discuss the important characteristics of the wave function.	
	(g) What is the working principle of a LASER? What are the application of a LASER?	
	(h) What are step indexed and graded indexed fibers? Give three difference between them.	
	UNIT-I	
Q2	(a) A plane transmission grating having 6000 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between the two sodium lines whose wavelengths are 5890 Å and 5896 Å.	(5)
	(b) Describe the interference observed when a thin parallel shaped film is seen by transmitted light. Why the colors are in reflected and transmitted light are complementary?	(5)
Q3	(a) What do you understand by double refraction? Explain how would you use this phenomenon to produce plane-polarized light and circularly polarized light? Explain their production with the help of mathematical equations.	(5)
	(b) Discuss the phenomena of Fraunhoffer diffraction due to N slits and find out the condition for principle maxima.	(5)
	UNIT-II	
Q4	(a) Explain the concept of Maxwell's displacement current and show how it led to the modification of Ampere's law.	(5)
	(b) An electromagnetic wave is travelling in Z- Direction in a lossless dielectric medium with relative permeability μ_r=1 and	(5)

	relative permittivity $\varepsilon_r = 2$ it has a peak electric field strength $E_o = 5$ V/m. Find (1) impedance of the medium (2) peak magnetic field intensity (3) velocity of the wave	
Q5	(a) What is Poynting theorem? Discuss the physical significance of the all terms involved in Poynting theorem. (b) 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)
	UNIT-III	
Q6	(a) What is group velocity and phase velocity? Find a relation between Group Velocity and Particle Velocity and show that the wave group associated with the moving material particle travels with the same velocity as the particle. (b) What is Heisenberg uncertainty principle? Calculate the smallest possible uncertainty in the position of an electron moving with a velocity $3 \times 10^8\ m/s$.	(5) (5)
Q7	(a) Let us consider a particle restricted to move along the x axis between x = 0 and x = L, by ideally reflecting, infinitely high walls of the infinite potential well find its energy and corresponding wave function for n = 1,2,3 energy levels. (b) What are matter waves? (i) Calculate the deBroglie wavelength associated with the automobile of mass $2 \times 10^3\ kg$, which is moving with a speed 96 km/hr. (ii) Calculate the deBroglie wavelength of a photon of energy $5 \times 10^{-19}\ J$.	(5) (5)
	UNIT-IV	
Q8	(a) A light ray enters from air to a fiber. The refractive index of air is 1.0. The fiber has refractive index of core is equal to 1.5 and that of cladding is 1.48. Find the critical angle, the fractional refractive index, the acceptance angle and numerical aperture. (b) What are the main characteristics of a LASER? Why two level LASER is not possible and discuss the main component of a LASER?	(5) (5)
Q9	(a) Find a relation between the probabilities of spontaneous and stimulated emissions (b) What are the main components of optical fiber communication and discuss how the communication occur in optical Fiber?	(5) (5)