Printed Page:- **Subject Code:- AAS0101C**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2022 - 2023)

Subject: Engineering Physics

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1 Michelson and Morley experiment showed that (CO1) 1

(a) Newtonian mechanics is correct for all low and high velocities

(b) There is an absolute ether frame

(c) There is no absolute ether frame, but all frames are relative

(d) Velocity of light is relative in all cases

1 Decay of μ mesons supports: (CO1) 1

(a) Length contraction

(b) Time dilation

(c) Mass energy equivalence

(d) Variation of mass with velocity

1-c. Particle velocity is equal to ? (CO2) 1

(a) Phase velocity

(b) Group velocity

(c) Velocity of light

(d) None of these

1-d. In case of electrons and photons having the same wavelength. What is same for them? (CO2) 1

(a) Energy

(b) Momentum

(c) Velocity

(d) Angular momentum

1-e. Two coherent sources of light produced destructive interference when phase difference between them is (CO3) 1

(a) 0

(b) π/2

(c) π/4

(d) π

1-f. The incident wavefronts in Fresnel and Fraunhofer Diffraction are respectively _____. (CO3) 1

(a) Planar and Planar

(b) Planar and cylindrical

(c) Cylindrical and Planar

(d) Cylindrical and Cylindrical

1-g. The velocity of electromagnetic radiation in a medium of permittivity ε_o and permeability μ_o is given by (CO4) 1

(a) $\sqrt{\varepsilon_o/\mu_o}$

(b) $\sqrt{\varepsilon_o\mu_o}$

(c) $1/\sqrt{\varepsilon_o\mu_o}$

(d) $\sqrt{\mu_o\varepsilon_o}$

1-h. In electromagnetic waves, the electric field will be perpendicular to which of the following? (CO4) 1

(a) Magnetic field intensity

(b) Wave propagation

(c) Both H and wave direction

(d) It propagates independently

1-i. The relation between electric field E, the displacement vector D and Polarization P is given by (CO5) 1

(a) $D = \varepsilon_o E + P$

(b) $P = D + E$

(c) $P = D + \varepsilon_o E$

(d) $E = D + P$

1-j. When the air in a capacitor is replaced by a medium of dielectric constant K, the capacity (CO5) 1

(a) Deceases K times

(b) Increases K times

(c) The K2 times

(d) Remains constant

2. Attempt all parts:-

2.a. Write down the postulates of special theory of relativity. (CO1) 2

2.b. What is Higgs Boson? (CO2) 2

2.c. What are optical filters? (CO3) 2

2.d. What is the unit and dimension of Poynting vector. (CO4) 2

2.e. Define the term electric dipole moment. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. A particle of mass 'm' moves with speed $c/\sqrt{2}$. Calculate the mass, momentum, total energy and kinetic energy of the particle. (CO1) 6

3-b. The mass of a moving electron is 11 times its rest mass. Calculate its kinetic energy and momentum. (CO1) 6

3-c. An electron has deBroglie wavelength 2×10^{-12}m. Find its kinetic energy. (CO2) 6

3-d. Calculate the smallest possible uncertainty in the position of an electron moving with velocity 3×10^{7}m/s. (CO2) 6

3.e. Newton's rings are observed in the reflected light of wave length 5900 Å. The diameter of 10th dark ring is 0.6 cm. Find the radius of curvature of the lens used. (CO3) 6

3.f. A 100 watt sodium lamp is radiating its power. Calculate the electric field and magnetic field strength at a distance of 5 m from the lamp. (CO4) 6

3.g. The permittivity of diamond is 1.46×10^{-10} C^2/Nm^2. Determine its dielectric constant and electrical susceptibility. (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a.	Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate of special theory of relativity. (CO1)	10
4-b.	Describe Michelson -Morely experiment and explain the outcome of the experiment. (CO1)	10

5. Answer any <u>one</u> of the following:-

5-a.	What is uncertainty principle? How will you explain non existence of electrons in the nucleus? (CO2)	10
5-b.	Write the Schrodinger wave equations for particle in one dimensional box and solve it to obtain the Eigen values and Eigen functions (CO2)	10

6. Answer any <u>one</u> of the following:-

6-a.	Give the construction and theory of plane transmission grating and explain the formation of spectra by it. (CO3)	10
6-b.	Why Newton's rings are circular? Prove that in reflected light: (i) diameters of bright rings are proportional to the square root of odd natural numbers. (ii) Diameters of dark rings are proportional to the square root of natural numbers. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	Find the expression for electromagnetic wave in free space and show that electromagnetic wave travels with the speed of light in free space. (CO4)	10
7-b.	Define law of conservation of charge. Derive the expression for equation of continuity and give its physical significance. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	What is dielectric polarization? Explain all the four types of polarization briefly. (CO5)	10
8-b.	What is internal field? Derive an expression for internal field in liquids and solids. (CO5)	10