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 - CARRY OVER THEORY EXAMINATION - AUGUST 2022

Subject: Engineering Physics

Time: 3 Hours Max. Marks: 100

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 mark each.
3. Section B - Question No-3 is based on external choice carrying 6 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 10 marks each.
5. 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-a. According to relativity, length of a rod in motion (CO1) 1

(a) Is same as its rest length

(b) Is more than its rest length

(c) Is less than its rest length

(d) May be more or less than or equal to rest length depending on the speed of rod

1-b. Michelson Morley experiment is based on the phenomenon (CO1) 1

(a) Interference

(b) Diffraction

(c) Polarization

(d) Dispersion

1-c. Wave function Ψ gives the idea for (CO2) 1

(a) Energy of particle

(b) Probability of finding particle

(c) Momentum of particle

(d) None of these

1-d. Phase velocity is (CO2) 1

(a) Greater than C

(b) Equal to C

(c) Less than C

(d) None of these

1-e. The diffraction Phenomenon is (CO3) 1

(a) Bending of light around an obstacle

(b) Rectilinear propagation of light

(c) Oscillation of light wave in one direction

(d) None of above

1-f. In Newton' ring arrangement, the diameters of bright rings are (CO3) 1

(a) Directly proportional to the square roots of natural numbers

(b) Inversely proportional to the square roots of odd natural numbers

(c) Directly proportional to the square roots of odd natural numbers

(d) Directly proportional to the square roots of even natural numbers

1-g. The direction in which electromagnetic waves propagate is the same as that of (CO4) 1

(a) E × B

(b) B × H

(c) E

(d) B

1-h. 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-i. How does ionic polarization occur (CO5) 1

(a) Splitting of ion

(b) Passing magnetic field

(c) Displacement of cations and anions

(d) Never occurs

1-j. When does a dielectric become a conductor? (CO5) 1

(a) At avalanche breakdown

(b) At high temperature

(c) At dielectric breakdown

(d) In the presence of magnetic field

2. Attempt all parts:-

2.a. What is GPS? (CO1) 2

2.b. What are matter waves? (CO2) 2

2.c. What are the types of interference? (CO3) 2

2.d. What is physical significance of Maxwell's second equation (divB=0)? (CO4) 2

2.e. Define dielectric constant? (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. Show that the momentum of a particle of rest mass m_o and kinetic energy K_E is given by the expression $p = \sqrt{(K_E^2/c^2 + 2m_oK_E)}$. (CO1) 6

3-b. At what speed will the mass of a body be 2.25 times its rest mass? (CO1) 6

3-c. Find the probabilities of finding a particle trapped in a box of length L in the region from 0.45L to 0.55L for the ground and first excited state. (CO2) 6

3-d. Calculate the smallest possible uncertainty in the position of an electron moving with velocity 3×10^7m/s. (C02) 6

3.e. Newton’s rings are observed by keeping a spherical surface of 100 cm radius on a plane glass plate. If the diameter of the 15th bright ring is 0.590 cm and the diameter of the 5th ring is 0.336 cm, what is the wavelength of light used. (CO3) 6

3.f. Write Maxwell's equations in differential and integral forms and give their physical significances. (CO4) 6

3.g. What are peizo electric materials? Give examples. (CO5) 6

SECTION C 50

4. Answer any one of the following:-

4-a. State Einstein's postulates of special theory of relativity. Derive the Lorentz transformation equations. (CO1) 10

4-b. Derive Einstein’s mass energy relation. Give some evidence showing its validity. (CO1) 10

5. Answer any one of the following:-

5-a.	Define the wave function and give its physical significance. Also, Derive the time independent Schrodinger wave equations. (CO2)	10
5-b.	Derive an expression for phase and group velocity Also, Prove that phase velocity is greater than the velocity of light. (CO2)	10

6. Answer any one of the following:-

6-a.	Describe Newtons ring method to determine the wavelength of sodium light. What will happen in fringes if air film between planoconvex lens and glass plate is filled with a liquid of refractive index μFind the formula for μ(CO3)	10
6-b.	What do you understand by missing order spectrum? Show that only first order is possible if the width of grating element is less than twice of wavelength of light. (CO3)	10

7. Answer any one 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.	Show that EM waves are transverse in nature. (CO4)	10

8. Answer any one of the following:-

8-a.	Derive Clausius-Mossoti equation using the Lorenz Field in dielectric material. (CO5)	10
8-b.	Prove that in electronic polarization, the displacement of electron cloud is directly proportional to applied electric field. (CO5)	10