NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute)
Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow
B.Tech
SEM: I - THEORY EXAMINATION (2021 - 2022)
Subject: Engineering Physics

Time: 03:00 Hours   Max. Marks: 100

General Instructions:

1. All questions are compulsory. It comprises three Sections A, B and C.

- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - I questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type - II questions carrying 10 marks each.
- No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.

<div align="center">SECTION A   20</div>

1. Attempt all parts:-

1-a.   The rest mass of photon of energy E is: (CO1)   1
         1. zero
         2. Ec^2
         3. E/c^2
         4. None of above

1-b.   According to special theory of relativity (CO1)   1
         1. Speed of light is relative
         2. Speed of light is same in all inertial frames
         3. Time is relative
         4. Mass is relative

1-c.   Particle velocity is equal to ? (CO2)   1
         1. Phase velocity
         2. Group velocity
         3. Velocity of light
         4. None of these

1-d.   Which of the following can be a wave function? (CO2)   1
         1. tan x
         2. sin x
         3. cot x
         4. sec x

1-e.   In the diffraction pattern due to single slit, the width of the central maximum will be (CO3)   1
         1. Greater for a narrow slit
         2. Less for a narrow slit
         3. Greater for a broad slit
         4. Less for a broad slit

1-f. In Newton ring 's experiment ,fringes are circular because (CO3)   1
       1. The air film is symmetrical
       2. Of Plano convex lens
       3. Sodium lamp is used
       4. Glass plate is inclined at 450

1-g. Electromagnetic waves are produced by (CO4)   1
       1. A static charge
       2. An accelerated charge
       3. A moving charge
       4. Charged particles

1-h. The meaning of Div B = 0 is (CO4)   1
       1. B = 0
       2. There is no existence of isolated magnetic poles
       3. Curl B = 0
       4. Flow of current is zero

1-i. Dielectrics are (CO5)   1
       1. Electric Insulators
       2. Electric Conductors
       3. Materials that work under low voltage
       4. Hole conductors

1-j. The internal field in a dielectric that has polarization P under effect of applied electric field E is (CO5)   1
       1. $3\varepsilon_o P$
       2. $3\varepsilon_o E/P$
       3. $P/3\varepsilon_o$
       4. P/E

2. Attempt all parts:-

2-a. Define proper length and proper time. (CO1)   2

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

2-c. Why is the central spot in Newton's rings seen in reflected light dark? (CO3)   2

2-d. What is conservation of charge? (CO4)   2

2-e. What is ionic polarisation? (CO5)   2

<div align="center">SECTION B   30</div>

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

3-a. Find the velocity of a particle if its kinetic energy is three times of its rest mass energy. (CO1)   6

3-b. The proper life of a meson is 2×10^{-8} sec. calculate the mean life of a meson moving with a velocity of 0.8c. (CO1)   6

3-c. Derive an expression for the normalised wave function of a particle confined in one dimensional box. (CO2)   6

3-d. Calculate the smallest possible uncertainty in the position of an electron moving with velocity 3×10^7 m/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. Derive the expression for equation of continuity. (CO4)   6

3-g.	Explain ferro and peizo electricity. (CO5)	6

<div align="center">SECTION C   50</div>

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

4-a.	State the fundamental postulates of special theory of relativity and write the Lorentz transformation equations and discuss how these account for the phenomenon of length contraction. What is proper length? (CO1)	10
4-b.	Show that $x^2+y^2+z^2-c^2t^2=0$ is invariant under Lorentz transformation equations. (CO1)	10

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

6-a.	Discus the phenomenon of Fraunhofer diffraction at single slit and find the relative intensities of successive maximas. (CO3)	10
6-b.	Discuss the phenomenon of interference formation of interference fringes due to thin films and find the condition of maxima and minima. Show that the interference patterns of reflected and transmitted monochromatic light are complementary. (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.	If the earth receives 2 cal. min^{-1} cm^{-2} solar energy, what are the amplitudes of electric and magnetic fields of radiation? (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.	Derive Clausius-Mossoti equation using the Lorenz Field in dielectric material. (CO5)	10