Printed Page:- 04 **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 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-a. Two photons approach each other, their relative velocity will be (CO1) 1

(a) c/2

(b) Zero

(c) c/8

(d) c

1-b. 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-c. Relation Between group velocity and phase velocity is (CO2) 1

(a) $V_P = C^2 V_g$

(b) $V_P V_g = C^2$

(c) $V_P = V_g$

(d) $V_g = C^2 V_p$

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

(a) Phase velocity

(b) Group velocity

(c) Velocity of light

(d) None of these

1-e. Which of the following conserved when light waves interfere? (CO3) 1

(a) Amplitude

(b) Intensity

(c) Energy

(d) Momentum

1-f. In case of interference of two waves each of intensity I_0,then intensity at point of constructive interference will be (CO3) 1

(a) 4 I_o for coherent sources

(b) 2 I_o for coherent sources

(c) 4 I_o for incoherent sources

(d) $3I_o$ for incoherent sources

1-g. The velocity of light in free space is given by (CO4) 1

(a) $C = \sqrt{\varepsilon_o \mu_o}$

(b) $C = \sqrt{1/\varepsilon_o \mu_o}$

(c) $C = \sqrt{\mu_o/\varepsilon_o}$

(d) $C = \sqrt{\varepsilon_o/\mu_o}$

1-h. The displacement current arises due to (CO4) 1

(a) Positive charge only

(b) Negative charge only

(c) Both positive and negative charge

(d) Time varying electric field

1-i. A dielectric (CO5) 1

(a) does not contain molecules

(b) contains free charges

(c) does not contain free charges or electrons

(d) when placed between the plates of a capacitor, increases the electric field

at every point in the medium

1-j. If ε_r is the relative permittivity of an isotropic medium then the electric susceptibility is (CO5) 1

(a) $\varepsilon_r \varepsilon$

(b) ε_r

(c) ε_r-1

(d) $\varepsilon_r/\varepsilon_o$

2. Attempt all parts:-

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

2.b. Define group velocity and phase velocity. (CO2) 2

2.c. What are coherent source of light ? (CO3) 2

2.d. What do you understand by displacement current? (CO4) 2

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

SECTION B **30**

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

3-a. Calculate the work done to increase the speed of electron of rest energy 0.5 MeV from 0.8 c to 0.9 c. (CO1) 6

3-b. At what speed should a clock be moved so that it may appear to lose 1 minute in each hour? (CO1) 6

3-c. Calculate the velocity and kinetic energy of a neutron having deBroglie wavelength 1Å. (CO2) 6

3-d. Calculate the uncertainty in the momentum of an electron if uncertainty in its position is 10 Å. (CO2) 6

3.e. How many orders will be visible if the wavelength of incident radiation is 5000 Å and the number of lines on the grating is 2620 to an inch? (CO3) 6

3.f. Assuming that all the energy from a 1000 watt lamp is radiated uniformly; calculate the average values of the intensities of electric and magnetic fields of radiation at a distance of 2m from the lamp. (CO4) 6

3.g. If a NaCl crystal is subjected to an electric field to 1000 V/m and the resulting polarization is $4.3\times10^{-8}Cm^2$, calculate the relative permittivity of NaCl. $\varepsilon o = 8.85\times10^{-12}$ F/m. (CO5) 6

SECTION C **50**

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

4-a. Derive Einstein's mass energy relation. Give some evidence showing its 10

validity. (CO1)

4-b. State the postulates of special theory of relativity. Derive inverse Lorentz transformation equations. (CO1) 10

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

5-a. Derive time dependent and time independent Schrödinger equation? (CO2) 10

5-b. What is Heisenberg uncertainty principle? Apply it to find the radius of first orbit. (CO 2) 10

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

6-a. Describe and explain the formation of Newton's rings in reflected monochromatic light. Obtain the conditions for bright and dark fringe. (CO3) 10

6-b. What do you understand by resolving power and dispersive power of grating? Obtain the expressions for these in case of pane transmission grating. (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. Derive Maxwell equations in differential form and integral form basic law of electromagnetism. (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 mean by local field in a dielectric and how it is calculated for a cubic structure? (CO5) 10