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Subject Code:- AAS0101C

Roll. No:

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - CARRY OVER THEORY EXAMINATION - MAY 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. 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-b. If $v=c$, the length of a rod in motion is (CO1) 1
- (a) Zero
 - (b) Equal to proper length
 - (c) Less than proper length
 - (d) More than proper length
- 1-c. If the momentum of a particle is increased to four times, then de-Broglie wavelength will be (CO2) 1
- (a) Become twice
 - (b) Become half

- (c) Become four times
(d) Become one fourth
- 1-d. 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-e. When a drop of oil is spread on a water surface, it display beautiful colours in daylight because of (CO3) 1
(a) Interference of light
(b) Diffraction of light
(c) Refraction of light
(d) None of above
- 1-f. In Fraunhofer diffraction, the incident wave front should be (CO3) 1
(a) elliptical
(b) Plane
(c) Spherical
(d) Cylindrical
- 1-g. Which of the following laws do not form a Maxwell equation? (CO4) 1
(a) Planck's law
(b) Gauss's Law
(c) Faraday's law
(d) Ampere's Law
- 1-h. The dimensions of the quantity $\sqrt{\mu}/\sqrt{\epsilon}$ are equivalent to those (CO4) 1
(a) Momentum
(b) Current
(c) Force
(d) Resistance
- 1-i. The relation between electric field E , the displacement vector D and Polarization P is given by (CO5) 1
(a) $D = \epsilon_0 E + P$
(b) $P = D + E$
(c) $P = D + \epsilon_0 E$

$$(d) E = D + P$$

- 1-j. When the air in a capacitor is replaced by a medium of dielectric constant K, the capacity (CO5) 1
- (a) Decreases K times
 - (b) Increases K times
 - (c) The K² times
 - (d) Remains constant

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 optical filters? (CO3) 2
- 2.d. Define Poynting vector? (CO4) 2
- 2.e. What do you understand by term polarisation of dielectric and dielectric susceptibility? (CO5) 2

SECTION B

30

3. Answer any five of the following:-

- 3-a. Calculate the amount of work to be done to increase the speed of an electron from 0.6C to 0.8C. Given that rest energy of electron = 0.5MeV. (CO1) 6
- 3-b. Find the velocity of a particle if its kinetic energy is three times of its rest mass energy. (CO1) 6
- 3-c. Calculate the velocity and kinetic energy of a neutron having deBroglie wavelength 1Å. (CO2) 6
- 3-d. Calculate the energy difference between the ground state and first excited state for electron in one dimensional rigid box of length 10⁻⁸cm. (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 atomic weight and density of Sulphur are 32 and 2.08 gm (cm)⁻³ respectively. Relative dielectric constant of the atom is 3.8. If Sulphur solid has cubic symmetry, what will be its electronic polarizability? (CO5) 6

SECTION C

50

4. Answer any one of the following:-

- 4-a. Deduce an expression for time dilation on the basis of Lorentz transformation equations. Give an example to show that time dilation is real effect. (CO1) 10
- 4-b. Deduce an expression to show that mass of a body depends upon its velocity. Discuss the significance of mass energy relation. (CO1) 10

5. Answer any one of the following:-

- 5-a. What is uncertainty principle? How will you explain non existence of electrons in the nucleus? (CO2) 10
- 5-b. Derive time dependent and time independent Schrödinger equation? (CO2) 10

6. Answer any one 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. Discuss the phenomenon of interference in wedge shaped thin film by reflected light and find the condition of maxima and minima (CO3) 10

7. Answer any one of the following:-

- 7-a. Derive Maxwell equations in differential form and integral form basic law of electromagnetism. (CO4) 10
- 7-b. Find the expression for electromagnetic wave equations in free space and shows that electromagnetic wave travels with the speed of light in free space. (CO4) 10

8. Answer any one 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