Printed Page:- 04 **Subject Code:- AAS0201A** / AASH0201A

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM-II- 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. Special theory of relativity treats problems involving (CO1) 1

(a) Inertial frame of reference

(b) Non-inertial frame of reference

(c) Accelerated frame of reference

(d) All of the above

1-b. The rest mass of photon of energy E is: (CO1) 1

(a) zero

(b) Ec^2

(c) E/c^2

(d) None of above

1-c. De-broglie wavelength associated with lighter particle is ? (CO2) 1

(a) lesser than heavier particle wavelength

(b) equal to the heavier particle wavelength

(c) None of these

(d) greater than heavier particle wavelength

1-d. Light has (CO2) 1

(a) Wave nature

(b) Particle nature

(c) Both of these nature

(d) None of these

1-e. Two light sources are said to be coherent if waves produced by them have the same (CO3) 1

(a) Amplitude Only

(b) Wavelength Only

(c) Amplitude and Wavelength

(d) Frequency and constant phase difference

1-f. By observing the diffraction pattern, the two images are said to be just resolved when _____ (CO3) 1

(a) The central maxima of one image coincide with central maxima of the other

(b) The central maxima of one do not coincide with central maxima of the other

(c) The central maxima of one image coincides with the first minimum of the other

(d) The central maxima of one image do not coincide with the first minimum of other

1-g. Valence band and conduction band overlap each other in (CO4) 1

(a) Conductors

(b) Insulators

(c) Semiconductors

(d) None of these

1-h. The temporary memory of computer is (CO4) 1

(a) ROM

(b) secondary memory

(c) primary memory

(d) RAM

1-i. Step index sustain only (CO5) 1

(a) Single mode propagation

(b) Multimode of propagation

(c) Both

(d) None of these

1-j. Relation which was proved by Einstein's at thermal equilibrium state is (CO5) 1

(a) $B_{12}=B_{13}$

(b) $B_{12}=B_{21}$

(c) $B_{22}=B_{23}$

(d) $B_{21}=B_{31}$

2. Attempt all parts:-

2.a. Define the phenomenon of time dilation. (CO1) 2

2.b. How do matter waves differ from electromagnetic waves? (CO2) 2

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

2.d. Does Fermi level depend on temperature in extrinsic semiconductor? (CO4) 2

2.e. What is Attenuation? (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. A particle has a velocity, u'= 3i + 4j + 12k m/sec. in a co – ordinate system moving with velocity 0.8c relative to laboratory along +ve direction of x – axis. Find u in laboratory frame. (CO1) 6

3-c. A particle of rest mass m_o has a kinetic energy k. Show that the de-Broglie wavelength is given by $\lambda= hc/ \sqrt{[k(k+2m_o c^2)]}$ (CO2) 6

3-d. Calculate the smallest possible uncertainty in the position of an electron moving with velocity 4×10^8 m/s. (CO2) 6

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

3.f. Define drift velocity and mobility. How mobility is related to conductivity? (CO4) 6

3.g. The optical power, after propagation through a fibre that is 450 m long is reduced to 30% of its original value. Calculate the fiber loss in dB/km. (CO5) 6

SECTION C **50**

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

4-a. Show that velocity is variant and acceleration is invariant under Galilean 10

transformations. (CO1)

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

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

5-a. Derive an expression for phase and group velocity Also, Prove that phase velocity is greater than the velocity of light. (CO2) 10

5-b. Define the wave function and give its physical significance. Also, Derive the time independent Schrodinger wave equations. (CO2) 10

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

6-a. What do you understand by missing order spectrum? Show that only first order is possible if the width of grating elemment is less than twice of wavelength of light. (CO3) 10

6-b. Describe Newtons ring method to detrmine 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 μ. Find the formula for μ. (CO3) 10

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

7-a. Obtain an expression for the electrical conductivity of an intrinsic and extrinsic semiconductors. (CO4) 10

7-b. What are semiconductor memory devices? How they are used for memory storage? (CO4) 10

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

8-a. What are Einstein's coefficients? Obtain a relation between them. (CO5) 10

8-b. Discuss briefly the properties and application of optical fiber. (CO5) 10