**Printed Page:-**                         **Subject Code:- AAS0101A**

**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 - 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.*

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**SECTION A**                                                                          **20**

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**1. Attempt all parts:-**

1-a.    The time of observation of a pulse of light in a frame of reference moving with     1
velocity v is   (CO1)

(a) $1/(1-v^2/c^2)$

(b) $1/\sqrt{(1-v^2/c^2)}$

(c) $(1-v^2/c^2)$

(d) $\sqrt{(1-v^2/c^2)}$

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.     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.    Matter wave are ?   (CO2)                                                                1

(a) EM wave

(b) Sound wave

(c) None of these

(d) Wave associate with moving particle

1-e.    In the diffraction pattern due to single slit, the width of the central maximum     1
will be (CO3)

(a) Greater for a narrow slit

(b) Less for a narrow slit

(c) Greater for a broad slit

(d) Less for a broad slit

1-f.    Extended source is needed in     (CO3)                                               1

(a) Young's double slit experiment

(b) Bi prism Experiment

(c) Newton's Ring Experiment

(d) None of them

1-g.    The smallest Unit in digit system is   (CO 4)                                        1

(a) Bit

(b) Byte

(c) Kilobyte

(d) Megabyte

1-h.    The barrier potential depends on   (CO 4)                                            1

(a) doping density

(b) temperature

(c) electronic charges

(d) all of these

1-i.    Which of the following scheme does not produce lasing action?  (CO 5)               1

(a) Two level scheme

(b) Three- level scheme

(c) Four-level scheme

(d) Five -level scheme

1-j. It is the angle at which the propagating ray strikes the interface with respect to the normal. (CO 5)    1

      (a) refracted angle

      (b) Incident angle

      (c) Reflected angle

      (d) Critical angle

## 2. Attempt all parts:-

2.a. Explain the negative results of Michelson – Morley experiments. (CO 1)    2

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

2.c. What do you mean by grating and grating element? (CO3)    2

2.d. Name the three semiconductor memory devices. (CO4)    2

2.e. Write the Components of Laser devices. (CO5)    2

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**SECTION B**      **30**

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## 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 $2 \times 10^{-8}$ sec. calculate the mean life of a meson moving with a velocity of 0.8c. (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 $4 \times 10^8$ m/s. (CO2)    6

3.e. Find the minimum number of lines in a plane diffraction grating required to just resolve the sodium doublet (5890 & 5896 Angstrom) in the first order and second order. (CO3)    6

3.f. A 20-metre length of cable has a cross-sectional area of 1mm$^2$ and a resistance of 5 ohms. Calculate the conductivity of the cable. (CO4)    6

3.g. Calculate a fractional difference between core and cladding surface refractive indices for a step index fiber having core and cladding refractive indices 1.65 and 1.45 respectively. (CO 5)    6

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**SECTION C**      **50**

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

4-a. What is time dilation ? What is proper interval of time? Explain why a moving    10

clock appears to go slow to a stationary observer. (CO1)

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

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

5-a. A particle of charge q and mass m is accelerated through a potential difference V. Write an expression for its de-Broglie wavelength. Find the expression for the energy state of a particle in one dimensional box. (CO2)    10

5-b. Derive the time independent and time dependent Schrodinger wave equations. (CO2)    10

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

6-a. Explain the differnce between Fresnel and Fraunhoffer diffraction. Obtain the intensities of diffraction pattern in Fraunhoffer diffraction due to single slit. (CO3)    10

6-b. Discuss the formation of interference fringes due to a wedge shaped thin film seen by normally reflected sodium light and obtain an expression for the fringe width. (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 is Photovoltaic effect ? Discuss the construction and working of Photovoltaic cell with neat diagram. (CO4)    10

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

8-a. What is fiber optics? Discuss the properties and applications of optical fiber. (CO5)    10

8-b. Describe the construction and working of Ruby Laser. (CO5)    10