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 - THEORY EXAMINATION (2022 - 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. The time of observation of a pulse of light in a frame of reference moving with velocity v is (CO1) 1

(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. Michelson Morley experiment is based on the phenomenon (CO1) 1

(a) Interference

(b) Diffraction

(c) Polarization

(d) Dispersion

1-c. Light has (CO2) 1

(a) Wave nature

(b) Particle nature

(c) Both of these nature

(d) None of these

1-d. Which of the following is the correct relation between the group velocity and the phase velocity? (CO2) 1

(a) $v_g = v_p + \frac{\lambda dv_p}{d\lambda}$

(b) $v_p = v_g + \frac{\lambda^2 dv_p}{d\lambda}$

(c) $v_p = v_g - \frac{\lambda dv_p}{d\lambda}$

(d) $v_g = v_p - \frac{\lambda dv_p}{d\lambda}$

1-e. The diffraction Phenomenon is (CO3) 1

(a) Bending of light around an obstacle

(b) Rectilinear propagation of light

(c) Oscillation of light wave in one direction

(d) None of above

1-f. Which of the following sources gives best monochromatic light (CO3) 1

(a) A candle

(b) A bulb

(c) Mercury Lamp

(d) laser Source

1-g. Fermi-Dirac statistics is for the..... (CO 4) 1

(a) Distinguishable particle

(b) Symmetrical Particles

(c) Particles with half integral spin

(d) Particles with integral spin

1-h. A semiconductor has ..... temperature coefficient of resistance (CO 4) 1

(a) Positive

(b) Negative

(c) Zero

(d) None of these

1-i. Ruby LASER produces the Laser beam of Wavelength (CO5) 1

(a) 6943Å

(b) 6328 Å

(c) 6320 Å

(d) 6940 Å

1-j. The reduction in amplitude and intensity of a signal as it guided through an optical fiber is called (CO 5) 1

(a) Dispersion

(b) Attenuatio

(c) Diffusion

(d) None of above

2. Attempt all parts:-

2.a. Explain the concept of length contraction. (CO1) 2

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

2.c. What are missing orders? (CO3) 2

2.d. What are extrinsic semiconductors? (CO4) 2

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

SECTION B **30**

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. Show that the circle $x^2+ y^2 =a^2$ in frame S appears to be an ellipse in frame S' which is moving with velocity 'v' relative to S. (CO 1) 6

3-c. Calculate the smallest possible uncertainty in the position of an electron moving with velocity 3×10^7m/s. (C02) 6

3-d. Find the energy of lowest energy level and momentum of electron in one dimensional potential box of width 10 Å. (CO2) 6

3.e. A soap film of refractive index 1.43 is illuminated by white light incident at an angle of 30. The refracted light is examined by a spectroscope in which dark band corresponding to the wavelength 6000 Angstrom is observed. Calculate the thickness of the film. (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

SECTION C **50**

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

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

4-b. Derive the expression for relativistic velocity addition theorem. Show that the addition of velocity of light to the velocity of light merely reproduces the velocity of light. (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. 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. Describe and explain the formation of Newton’s rings in reflected monochromatic light. Obtain the conditions for bright and dark fringe. (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 do you understand by attenuation in optical fiber? Discuss the important factors responsible for the loss of power in optical fiber. (CO5) 10

8-b. Describe the Energy level diagram to explain the working of He-Ne Laser. (CO5) 10