Printed Page:- 04 **Subject Code:- BAS0201A**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2023 - 2024)

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. Choose the incorrect statement concerning the theory of relativity: (CO1) 1

(a) It proves the existence of ether

(b) Velocity of light is independent of the motion of observer

(c) There is variation of mass with velocity

(d) Time is relative

1-b. Decay of μ mesons supports: (CO1) 1

(a) Length contraction

(b) Time dilation

(c) mass energy equivalence

(d) variation of mass with velocity

1-c. According to wave mechanics, a material particle is associated with: (CO2) 1

(a) A single wave

(b) A wave packet

(c) Two progressive waves travelling in the same direction

(d) A ripple

1-d. Schrödinger's equation is a : (CO2) 1

(a) First order differential equation

(b) Second order differential equation

(c) Both of the above

(d) None of the above

1-e. If there are N number of slits in a grating spectra, then there will be how many secondary maxima? (CO3) 1

(a) N

(b) N – 1

(c) N – 2

(d) 2N

1-f. A thin film is observed in white light. The colour of the film seen at a particular point depends upon: (CO3) 1

(a) Location of observer

(b) Width of the source

(c) Distance of the source

(d) Brightness of the source

1-g. The movement of a hole results from : (CO4) 1

(a) Excitation due to high temperature

(b) Change in number of protons in the atom

(c) The vacancy filled by a valence electron from the neighbouring atom

(d) None of above

1-h. The smallest Unit in digit system is : (CO4) 1

(a) Bit

(b) Byte

(c) Kilobyte

(d) Megabyte

1-i. Laser beam is made of (CO 5) 1

(a) Electrons

(b) Highly coherent photons

(c) Very light and elastic particles

(d) None of above

1-j. What is the other name for a maximum external incident angle? (CO5) 1

(a) Optical angle

(b) Total internal reflection angle

(c) Refraction angle

(d) Wave guide acceptance angle

2. Attempt all parts:-

2.a. How GPS is used? (CO 1) 2

2.b. What does square of wave function (Ψ) signify? (CO 2) 2

2.c. Discuss the working principle of optical filters. (CO 3) 2

2.d. Explain the concept of conduction and valence bands with neat diagrams. (CO 4) 2

2.e. Why cooling is required in Ruby laser? (CO5) 2

SECTION B **30**

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

3-a. 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-b. A clock keeps correct time. With what speed should it be moved relative to an observer so that it may be appear to lose 4 minutes in 24 hours. (CO 1) 6

3-c. Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to (1/50) th of the velocity of light. (CO2) 6

3-d. Compute the energy of a neutron confined to nucleus which is considered as box with size of 10^{-14} m. (CO2) 6

3.e. In a Newton's ring experiment, the diameter of the 5th ring is 0.30 cm and diameter of the 15th ring is 0.62cm. Find the diameter of the 25th ring. (CO 3) 6

3.f. Find the value of f(E) for $E-E_f = 0.02eV$ at 100K. (CO4) 6

3.g. Calculate the energy and momentum of a photon of a laser beam of wavelength 6328 Å. (CO 5) 6

SECTION C **50**

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

4-a. Show from Lorentz transformation that two events simultaneous($t_1=t_2$) at different positions ($x_1 \neq x_2$)(in a reference frame S are not in general simultaneous in another reference frame. (CO1) 10

4-b. Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate of special theory of relativity. (CO1) 10

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

5-a.	What is Heisenberg uncertainty principle? Apply it to find the radius of Bohr's first orbit. (CO2)	10
5-b.	Apply Schrodinger's wave equations for particle in one dimensional box and solve it to obtain the Eigen values and Eigen functions. (CO2)	10

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

6-a.	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
6-b.	Discuss Rayleigh criterion for resolution. What do you mean by the resolving power of grating? Derive the necessary expression for it. (CO3)	10

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

7-a.	Discuss the position and variation of Fermi level with temperature in the p-type semiconductor. (CO4)	10
7-b.	What is the principle of working of Solar cell? Explain the construction and working of Solar cell ? (CO4)	10

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

8-a.	Describe the propagation mechanism and also discuss signal loss in optical fibers. (CO5)	10
8-b.	What is the working principle of laser? Discuss the construction and working of a Ruby laser. (CO5)	10