Printed Page:-04 **Subject Code:- BAS0101AZ / BASH0101AZ**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: I - THEORY EXAMINATION (2024 - 2025)

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 rest mass of photon of energy E is: (CO1,K1) 1

(a) zero

(b) Ec^2

(c) E/c^2

(d) None of above

1-b. According to special theory of relativity (CO1,K1) 1

(a) Speed of light is relative

(b) Speed of light is same in all inertial frames

(c) Time is relative

(d) Mass is relative

1-c. Wave function Ψ gives the idea for (CO2,K1) 1

(a) Energy of particle

(b) Probability of finding particle

(c) Momentum of particle

(d) None of these

1-d. Matter wave are ? (CO2,K1) 1

(a) EM wave

(b) Sound wave

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(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 will be (CO3,K1) 1

(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. The modification in the intensity of light resulting from the superposition of two waves of same frequency and having a constant phase difference, is called (CO3,K1) 1

(a) Interference

(b) Diffraction

(c) Polarization

(d) Dispersion

1-g. The smallest Unit in digit system is (CO4,K1) 1

(a) Bit

(b) Byte

(c) Kilobyte

(d) Megabyte

1-h. When a semiconductor is heated its resistance (C04,K1) 1

(a) Increases

(b) Decreases

(c) Remains Constant

(d) None of above

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. It is the angle at which the propagating ray strikes the interface with respect to the normal. (CO5,K1) 1

(a) refracted angle

(b) Incident angle

(c) Reflected angle

(d) Critical angle

2. Attempt all parts:-

2.a. What is GPS? (CO1,K2) 2

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2.b.	Define group velocity and phase velocity. (CO2,K2)	2
2.c.	What are missing orders? (CO3,K2)	2
2.d.	What are extrinsic semiconductors? (CO4,K2)	2
2.e.	What are the components of Laser devices? (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	An electron is moving with velocity 0.98 times the velocity of light in laboratory frame of reference. Find its kinetic energy. (CO1,K3)	6
3-b.	The proper life of a meson is 2×10^{-8}sec. calculate the mean life of a meson moving with a velocity of 0.8c. (CO1,K3)	6
3-c.	Calculate the smallest possible uncertainty in the position of an electron moving with velocity 3×10^{7}m/s. (C02,K3)	6
3-d.	Find the de-Broglie wavelength of a neutron of energy 12.8 MeV. (CO2,K3)	6
3.e.	A soap film of refractive index 1.45 is illuminated with light of different wavelengths at an angle 45^{o}. There is complete destructive interference for $\lambda = 5890$ Å. Find the least thickness of the film. (CO3,K3)	6
3.f.	Find the value of f(E) for $E-E_f = 0.01$eV at 400K. (CO4,K3)	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 one of the following:-

4-a.	State Einstein's postulates of special theory of relativity. Derive the Lorentz transformation equations. (CO1,K3)	10
4-b.	Derive Einstein’s mass energy relation. Give some evidence showing its validity. (CO1,K3)	10

5. Answer any one 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.	What is uncertainty principle? How will you explain non existence of electrons in the nucleus? (CO2,K2)	10

6. Answer any one of the following:-

6-a.	Describe Newtons ring method to determine 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 μFind the formula for μ(CO3,K2)	10
6-b.	Discus the phenomenon of Fraunhofer diffraction at single slit and find the relative intensities of successive maximas. (CO3,K2)	10

7. Answer any one of the following:-

7-a.	Explain the working of solar cell. (CO4,K2)	10
7-b.	Show that Fermi level in an intrinsic semiconductor lies half way between the top	10

of the valence band and bottom of the conduction band. (CO4)

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

8-a.	Describe the Energy level diagram to explain the working of He-Ne Laser. (CO5)	10
8-b.	Describe various types of optical fibers on basics of modes and core refractive index? (CO5,K2)	10

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