Printed Page:- 04 **Subject Code:- BAS0101AZ /BASH0101Z**

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. According to special theory of relativity (CO1,KI) 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-b. Michelson Morley experiment is based on the phenomenon (CO1.K1) 1

(a) Interference

(b) Diffraction

(c) Polarization

(d) Dispersion

1-c. deBroglie wavelength associated with lighter particle is (CO2,K1) 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. The walls of a particle in a box are supposed to be _____ (CO2,K1) 1

(a) Small but infinitely hard

(b) Infinitely large but soft

(c) Soft and Small

(d) Infinitely hard and infinitely large

1-e. In Fresnel diffraction (CO3,K1) 1

(a) source of light is kept at infinite distance from the aperture
(b) source of light is kept at finite distance from the aperture
(c) Convex lens used
(d) . aperture width is selected so that it can acts as a point source

1-f. Interference of light is evidence that: (CO3,K1) 1

(a) The speed of light is very large
(b) light is a transverse wave
(c) light is electromagnetic in character
(d) Light is a wave phenomenon

1-g. The temporary memory of computer is(CO4,K1) 1

(a) ROM
(b) secondary memory
(c) primary memory
(d) RAM

1-h. In a semiconductor the gap between conduction band and valence band is of the order of(CO4,K1) 1

(a) 5 eV
(b) 10 eV
(c) 15 eV
(d) 1 eV

1-i. Numerical apertures depends on : (CO5,K1) 1

(a) Diameter of fiber
(b) Propagation angle
(c) Acceptance angle
(d) Critical angle

1-j. The ratio of Einstein's coefficients pf spontaneous and stimulated emission varies with the frequency as: (CO5,K1) 1

(a) ν
(b) $\nu^{1/2}$
(c) $\nu^{3/2}$
(d) ν^{3}

2. Attempt all parts:-

2.a. What was the main object of Michelson – Morley experiment? (CO1,K2) 2

2.c. What is Rayleigh criterion for resolution? (CO3,K2) 2

2.b. State & explain Heisenberg uncertainty principle for position & momentum. (CO2,K2) 2

2.d.	What is Fermi level?(CO4,K2)	2
2.e.	Explain the meaning of the Population Inversion. (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	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-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. (CO1,K3)	6
3-c.	Find the de-Broglie wavelength of a neutron of energy 12.8 MeV. (CO2,K3)	6
3-d.	Find the energy of lowest energy level and momentum of electron in one dimensional potential box of width 1Å. (CO2,K3)	6
3.e.	A film of refractive index is illuminated by white light at an angle of incidence i. In reflected light two consecutive bright fringes of wavelength λ_1 and λ_2 is found to be overlapping. Obtaining an expression for the thickness of the film. (CO3,K3)	6
3.f.	In an N-type semiconductor, the fermi level is 0.2 eV below the conduction band at 300K. If the temperature 330K, find the new position of fermi level. (CO4,K3)	6
3.g.	Calculate the numerical aperture and angle of acceptance for an optical fiber having refractive indices 1.563 and 1.498 for core and cladding respectively.(CO5,K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	What do you mean by time dilation? Explain with the help of a mathematical proof. Justify with an experimental evidence to show that time dilation is a real effect.? (CO1,K2)	10
4-b.	State Einstein's postulates of special theory of relativity. Derive the Lorentz transformation equations. (CO1,K3)	10

5. Answer any one of the following:-

5-a.	Define particle velocity and group velocity. Prove that group velocity is equal to particle velocity. (CO2,K3)	10
5-b.	Define the wave function and give its physical significance. Also, Derive the time independent Schrodinger wave equations. (CO2,K3)	10

6. Answer any one of the following:-

6-a.	Discuss the phenomenon of interference in uniform thin films by reflected light and find the condition of maxima and minima. (CO3,K2)	10
6-b.	What is resolving power of a plan transmission grating? Derive the expression for it. (CO3,K3)	10

7. Answer any one of the following:-

7-a.	Obtain an expression for the electrical conductivity of an intrinsic and extrinsic semiconductors. (CO4,K3)	10

7-b.	What do you understand by memory device? Explain the different types of memory device? (CO4,K2)	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,K2)	10
8-b.	What are different methods of pumping? Explain construction and working of Ruby Laser.(CO5,K2)	10