Printed Page:- 04 **Subject Code:- BAS0201B**

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. Special theory of relativity treats problems involving (CO1) 1

(a) Inertial frame of reference

(b) Non-inertial frame of reference

(c) Accelerated frame of reference

(d) None

1-b. Michelson and Morley experiment was designed to measure (CO1) 1

(a) The relativistic mass of an electron

(b) The relativistic energy of electron

(c) The velocity of earth relative to ether

(d) The acceleration of gravity on earth surface

1-c. A moving particle is associated with a wave packet or group of waves. The group velocity is equal to: (CO2) 1

(a) Velocity of light

(b) Velocity of sound

(c) velocity of the particle

(d) None of the above

1-d. In case of electrons and photons having the same wavelength. What is same for them? (CO2) 1

(a) Energy

(b) Momentum

(c) Velocity

(d) Angular momentum

1-e. How many lenses are used in Fraunhofer Diffraction? (CO3) 1

(a) Two Convex lenses

(b) Two Concave lenses

(c) One Convex lens

(d) No lens used

1-f. Interference of light is evidence that: (CO3) 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. Atomic packing factor for BCC is (CO4) 1

(a) 0.52

(b) 0.74

(c) 0.68

(d) None of these

1-h. The group of points arranged in regular fashion in three dimensions is called_____ (CO4) 1

(a) Crystalline

(b) Amorphous

(c) Non-crystalline

(d) None of these

1-i. The temperature at which a conductor becomes a superconductor is known as (CO5) 1

(a) Curie temperature

(b) Onne's temperature

(c) Critical temperature

(d) None of these

1-j. When a material makes the transition from the normal to superconducting state, it actively excludes magnetic fields from its interior, this is known as (CO5) 1

(a) Magnetic levitation

(b) Meissner effect

(c) Josephson effect

(d) None of these

2. Attempt all parts:-

2.a. What is the difference between inertial or non inertial frame of reference? (CO1) 2

2.b. Explain wave particle duality and de-Broglie's hypothesis of matter waves. (CO2) 2

2.c. Why is the central spot in Newton's rings seen in reflected light dark? (CO3) 2

2.d. What do you understand by coordination number and atomic packing density or factor? (CO4) 2

2.e. What are High temperature superconductors? (CO5) 2

SECTION B **30**

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

3-a. 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. (CO1) 6

3-b. At what speed will the mass of a body be 2.25 times its rest mass? (CO1) 6

3-c. Calculate the velocity and kinetic energy of a neutron having de-Broglie wavelength 1Å. (CO2) 6

3-d. Calculate the energy difference between the ground state and first excited state for electron in one dimensional rigid box of length 10^{-8}cm. (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. Calculate the inter planner spacing for (1 0 1) plane in a simple cubic crystal whose lattice constant is 0.42 nm. (CO4) 6

3.g. What are the applications of nanotechnology? (CO5) 6

SECTION C **50**

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

4-a. Deduce an expression for the variation of mass with velocity. Discuss the significance of mass energy relation. (CO1) 10

4-b. What is the meaning of proper length? Explain how Lorentz transformation equations results in the phenomenon of length contraction. (CO1) 10

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

5-a. What do you mean by phase velocity and group velocity? Prove that phase velocity is greater than the velocity of light. (CO2) 10

5-b. Derive an expression for the normalised wave function and energy of a particle confined in one dimensional box also define the eigen value and eigen function.(CO2) 10

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

6-a. What do you understand by interference. Discuss the phenomenon of interference in uniform thin films by transmitted light and find the condition of maxima and minima. (CO3) 10

6-b. What are Newton rings. Show the experimental set up of Newton's ring formation. Find the expression for diameter of dark and bright fringes in newton's ring arrangement. (CO3) 10

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

7-a. Explain seven crystal systems with their fourteen Bravais space lattices. (CO4) 10

7-b. What are Miller indices? How are they determined? Give example. (CO4) 10

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

8-a. Explain briefly the salient points of BCS theory. How this theory supports the conduction in superconductors? (CO5) 10

8-b. What do you mean by Nanotubes? Discuss in brief the Single walled and multiwalled nanotubes. (CO5) 10