Printed Page:-04 **Subject Code:- AAS0201B**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: II - 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. What will be the rest energy of an electron? (CO1, K1) 1

(a) 0.41 MeV
(b) 0.51 MeV
(c) 0.61 MeV
(d) 0.71 MeV

1-b. According to relativity, length of a rod in motion (CO1, K1) 1

(a) Is same as its rest length
(b) Is more than its rest length
(c) Is less than its rest length
(d) May be more or less than or equal to rest length depending on the speed of rod

1-c. The wavelength of the matter wave is independent of: (CO2, K1) 1

(a) Mass
(b) Velocity
(c) Momentum
(d) Charge

1-d. At what condition, vp = vg? (CO2, K1)) 1

(a) $\frac{dv_p}{dk} = 0$
(b)

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$\frac{dv_p}{d\lambda} = 0$

(c) $\frac{dv_p}{d\mu} = 0$

(d) $\frac{dv_p}{d\omega} = 0$

1-e. When a light wave suffers reflection at the interface between air and glass medium, the change of phase of the reflected wave in air is equal to: (CO3, K1) 1

(a) 0

(b) Π

(c) 2Π

(d) Π/2

1-f. The diffraction Phenomenon is (CO3, K1) 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-g. Number lattice points in a primitive cell is (CO4, K1) 1

(a) One

(b) Two

(c) Four

(d) Depends on type of bravais lattice

1-h. Atomic packing factor for BCC is (CO4, K1) 1

(a) 0.52

(b) 0.74

(c) 0.68

(d) None of these

1-i. The temperature at which a conductor becomes a superconductor is known as (CO5, K1) 1

(a) Curie temperature

(b) Onne's temperature

(c) Critical temperature

(d) None of these

1-j. The Chemical bonding of carbon nano-tubes is composed entirely of (CO5, K1) 1

(a) sp bonds

(b) sp2 bonds

(c) sp3 bonds

(d) None of these

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2. Attempt all parts:-

2.a.	What do you understand by frame of reference? What are their types? (CO1, K1)	2
2.b.	Distinguish between phase velocity and group velocity. (CO2, K1)	2
2.c.	What is resolving power? (CO3, K1)	2
2.d.	What do you understand by space lattice? CO4, K1)	2
2.e.	What is the phenomenon of superconductivity? (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	At what speed will the mass of a body be 2.25 times its rest mass? (CO1, K3)	6
3-b.	Calculate the amount of work to be done to increase the speed of an electron from 0.6c to 0.8c. Given that rest energy of electron = 0.5MeV. (CO1, K3)	6
3-c.	Find the de-Broglie wavelength of a neutron of energy 12.8 MeV. (CO2, K3)	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, K3)	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, K3)	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, K3)	6
3.g.	Explain Temperature dependence of resistivity in superconductors. (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate of special theory of relativity. (CO1, K2)	10
4-b.	Describe Michelson -morely experiment and explain the outcome of the experiment. (CO1, K2)	10

5. Answer any one of the following:-

5-a.	What is uncertainty principle? How will you explain non existence of electrons in the nucleus? (CO2, K2)	10
5-b.	Derive the time independent and time dependent Schrodinger wave equations. (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Explain the experimental arrangement of Newtons ring. Why the center of newtons ring is dark? Find the refractive index of a liquid with the help of newtons ring formation. (CO3, K2)	10
6-b.	Give the construction and theory of plane transmission grating and explain the formation of spectra by it. (CO3, K2)	10

7. Answer any one of the following:-

7-a.	Describe the structure of NaCl crystal. CO4, K2)	10

7-b.	What are the different types of Bravais lattice in the 7 crystal system. CO4, K1)	10

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

8-a.	Explain Meissner effect. Show that superconductors become perfect diamagnetic in an external magnetic field. (CO5, K2)	10
8-b.	Describe C_{60} buckyballs. Give some properties and uses of Buckyballs. (CO5, K2)	10

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