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Subject Code:- AAS0201B

Roll. No:

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - CARRY OVER THEORY EXAMINATION - MAY 2023

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) Non-accelerated frame of reference
 - (d) Accelerated frame of reference
- 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. Matter wave are ? (CO2) 1
- (a) EM wave
 - (b) Sound wave
 - (c) None of these

- (d) Wave associate with moving particle
- 1-d. Wave function Ψ gives the idea for (CO2) 1
- (a) Energy of particle
 - (b) Probability of finding particle
 - (c) Momentum of particle
 - (d) None of these
- 1-e. The interference phenomenon can take place (CO3) 1
- (a) In transverse waves only
 - (b) In Longitudinal waves only
 - (c) In standing waves only
 - (d) All of above
- 1-f. When a drop of oil is spread on a water surface, it display beautiful colours in daylight because of (CO3) 1
- (a) Interference of light
 - (b) Diffraction of light
 - (c) Refraction of light
 - (d) None of above
- 1-g. Co-ordination number in case of Simple cubic structure is (CO4) 1
- (a) 12
 - (b) 6
 - (c) 2
 - (d) 8
- 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. In BCS theory, the Cooper pairs is the pairs of (CO5) 1
- (a) Two electrons of anti-parallel spin
- (b) Two electrons of parallel spin
- (c) One electron and one proton
- (d) None of these

2. Attempt all parts:-

- 2.a. Is earth an inertial or non – inertial frame of reference? Explain. (CO1) 2
- 2.b. State & explain Heisenberg uncertainty principle for position & momentum. (CO2) 2
- 2.c. What are optical filters? (CO3) 2
- 2.d. What is the difference between crystalline and amorphous solids? (CO4) 2
- 2.e. What do you understand about nanoparticles and nanomaterials? (CO5) 2

SECTION B

30

3. Answer any five of the following:-

- 3-a. How fast would a rocket have to go relative to an observer for its length to contracted to 99% of its length at rest? (CO1) 6
- 3-b. The mass of a moving electron is 11 times its rest mass. Calculate its kinetic energy and momentum. (CO1) 6
- 3-c. A particle of rest mass m_0 has a kinetic energy k . Show that the de-Broglie wavelength is given by $\lambda = hc / \sqrt{[k(k+2m_0 c^2)]}$ (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. Newton's rings are observed by keeping a spherical surface of 100 cm radius on a plane glass plate. If the diameter of the 15th bright ring is 0.590 cm and the diameter of the 5th ring is 0.336 cm, what is the wavelength of light used? (CO3) 6
- 3.f. What are the practical applications of X-rays? (CO4) 6
- 3.g. Write the concept of Maglev vehicles. (CO5) 6

SECTION C

50

4. Answer any one of the following:-

- 4-a. Deduce an expression for time dilation on the basis of Lorentz transformation equations. Give an example to show that time dilation is real effect. (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 one of the following:-

- 5-a. Derive an expression for phase and group velocity and also, prove that phase velocity is greater than the velocity of light. (CO2) 10
- 5-b. Define the wave function and give its physical significance. Also, Derive the time independent Schrodinger wave equations. (CO2) 10

6. Answer any one of the following:-

- 6-a. Discuss the phenomenon of formation of interference fringes due to thin films and find the condition of maxima and minima. Show that the interference patterns of reflected and transmitted monochromatic light are complementary. (CO3) 10
- 6-b. Explain the difference between Fresnel and Fraunhofer diffraction. Obtain the intensities of diffraction pattern in Fraunhofer diffraction due to single slit. (CO3) 10

7. Answer any one of the following:-

- 7-a. Deduce the number of lattice point per unit cell for simple cubic, body centered and face centered cubic lattices. (CO4) 10
- 7-b. What are Miller indices? How are they determined? Give example. (CO4) 10

8. Answer any one of the following:-

- 8-a. Differentiate between Type-I and Type-II superconductors. (CO5) 10
- 8-b. Describe C60 buckyballs. Give some properties and uses of Buckyballs. (CO5) 10