NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (2020 - 2021)

Subject: Engineering Physics

Time: 03:00 Hours   Max. Marks: 100

General Instructions:

- All questions are compulsory. It comprises of three Sections A, B and C.
- Section A - Question No- 1 is objective type question carrying 1 mark each & Question No- 2 is Very short type questions carrying 2 marks each.
- Section B - Question No- 3 is Long answer type - 1 questions carrying 6 marks each.
- Section C - Question No- 4 to 8 are Long answer type -2 questions carrying 10 marks each.

1. Attempt all parts:-

1-a.   Length contraction happens only   1

        1. Perpendicular to direction of motion

        2. Along direction of motion

        3. Parallel to direction of motion

        4. Both a and b

1-b.   Michelson and Morley experiment showed that   1

        1. Newtonian mechanics is correct for all low and high velocities

        2. There is an absolute ether frame

        3. There is no absolute ether frame, but all frames are relative

        4. Velocity of light is relative in all cases

1-c.   De-Broglie wavelength for an electron   1

        1. $\lambda = 12.28/\sqrt{V}$) Å

        2. $\lambda = 1.28/\sqrt{V}$) Å

        3. $\lambda = 1.228/\sqrt{V}$) Å

        4. $\lambda = 122.8/\sqrt{V}$) Å

1-d.   Light has   1

        1. Wave nature

        2. Particle nature

        3. Both of these nature

        4. None of these

1-e.   Which of the following conserved when light waves interfere   1

        1. Amplitude

        2. Intensity

3. Energy

4. Momentum

1-f.   The diffraction Phenomenon is   1

      1. Bending of light around an obstacle

      2. Rectilinear propagation of light

      3. Oscillation of light wave in one direction

      4. None of above

1-g.   Valence band and conduction band overlap each other in   1

      1. Conductors

      2. Insulators

      3. Semiconductors

      4. None of these

1-h.   Which of the following statements is not correct about n-type semiconductors?   1

      1. They are obtained by adding pentavalent impurity to intrinsic semiconductors

      2. There is a large no. of free electrons

      3. There are some holes as minority charge carriers

      4. Doping gives negatively charged acceptors and negatively charged free electrons

1-i.   In Fiber optics, the signal is _____ waves.   1

      1. Light

      2. Radio

      3. Infrared

      4. Very low frequency

1-j.   When the angle of incidence is _____ the critical angle, the light beam bends along the interface.   1

      1. More than

      2. Less than

      3. Equal to

      4. None of above

2. Attempt all parts:-

2-a.   What is the difference between inertial or non inertial frame of reference?   2

2-b.   What are matter waves?   2

2-c.   What are coherent source of light ?   2

2-d.   Where does the Fermi level lie in intrinsic semiconductor?   2

2-e.   What is Meta-stable state?   2

3. Answer any <u>five</u> 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?   6

3-b.   The mass of a moving electron is 11 times its rest mass. Calculate its kinetic energy and momentum.   6

3-c.	What is uncertainty principle? How will you explain non existence of electrons in the nucleus?	6
3-d.	Calculate the wavelegth associated with 1MeV electron and 1MeV Proton	6
3-e.	Discuss the phenomenon of interference of light due to thin films of uniform thickness in reflected light.	6
3-f.	Explain the working of solar cell.	6
3-g.	What is Stimulated Emission of radiation.?	6

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

4-a.	Show that velocity is variant and acceleration is invariant under Galilean transformations.	10
4-b.	Show that $x^2+y^2+z^2-c^2t^2=0$ is invariant under Lorentz transformation equations.	10

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

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

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

6-a.	Discus the phenomenon of Fraunhofer diffraction at single slit and find the relative intensities of successive maximas.	10
6-b.	Describe Newtons ring method to detrmine 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	10

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

7-a.	Discuss the temperature dependence of electron and hole concentration.	10
7-b.	What are semiconductor memory devices? How they are used for memory storage?	10

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

8-a.	Explain the Spontaneous and Stimulated Emission of radiation. Why is Spontaneous Emission incoherent?	10
8-b.	Describe various types of optical fibers on modes and core refractive index?	10