

BAS-02

Roll No.

2017091033

B. Tech. I
ODD SEMESTER
MAJOR EXAMINATION 2017 - 2018
Subject Name: Engineering Physics-I

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

Max. Marks: 50

1. Attempt any four parts of the following:

(4 × 2.5 = 10)

- (a) Show that the massless particles can exist only if they move with speed of light and their energy E and momentum p must have the relation $E = pc$.
- (b) Obtain the relativistic form of Newton's second law, when force (F) is parallel to v .
- (c) Describe the postulates of Statistical Mechanics
- (d) How much does a proton gain in mass when accelerated to a kinetic energy of 500 MeV?
- (e) Find the speed of 0.1 MeV electrons according to the classical and relativistic mechanics.
- (f) Using the postulates of special theory of relativity derive the Lorentz transformation equations.

2. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) What was the objective of Davison- Germer experiment? Discuss the results of this experiment.
- (b) An electron is confined to move between two rigid walls separated by 1 \AA . Find the de Broglie wavelength representing the first three allowed energy states of the electron and their corresponding energies.
- (c) Derive Maxwell-Boltzman Distribution law for N number of distinguished particles.

3. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) Explain the construction and working of Huygens eyepiece. Locate the positions of cardinal points with suitable depiction.
- (b) Derive an expression for the intensity distribution due to Fraunhofer diffraction at a single slit and show that the intensity of the first subsidiary maximum is about 4.5% of that of the principal maximum.
- (c) Discuss the production and detection of linearly, circularly and elliptically polarized light.

(2 × 5 = 10)

4. Attempt any two parts of the following:

- (a) Describe the phenomena of interference due to wedge-shaped thin film obtain the conditions of maxima and minima also find the expression for fringe width.
- (b) Define phase velocity and group velocity. Show that the group velocity is always equal to the particle velocity.
- (c) An electron has de Broglie wavelength $2 \times 10^{-12} \text{ m}$. Find its kinetic energy. Also, find the phase and group velocities of its de Broglie waves.

5.

Attempt any two parts of the following:

(2 × 5 = 10)

- (a) What are the essential requirements for a laser? Explain the construction and working of He-Ne Laser with a suitable diagram.
- (b) (i) An optical fibre has an NA of 0.20 and a cladding refractive index of 1.59. Determine the angle for the fibre in water, which has a refractive index of 1.33.
(ii) Explain the light propagation in an optical fibre.
- (c) Discuss the construction and reconstruction of an image with the help of a hologram.