GLA University ,Mathura

B.Tech Ist Year Ist Semester

First midterm Examination 2010-2011

Max. Time: 1.5 hrs. **Physics** **M.M.:40**

Note: Attempt all sections

Section A

Attempt all questions **1×10 = 10**

Q.1 Earth is

(i) a non – inertial frame (ii) an inertial frame (iii) inertial frame at night and non-inertial at day
(iv) None of these

Q.2 The postulates of special theory of relativity are applicable to

(i) Accelerated frame (ii) Inertial frame (iii) Stationary frame (iv) None of these

Q.3. In Lorentz transformations

(i) $x' = x/\sqrt{1 - v2/c2}$ (ii) $x' = x - vt/\sqrt{1 - v2/c2}$ (iii) $x' = x + vt/\sqrt{1 - v2/c2}$
(iv) $x' = x.vt/\sqrt{1 - v2/c2}$

Q.4 Two photons approach each other. Their relative velocity will be

(i) 2c (ii) c (iii) c/2 (iv) 0

Q.5 Decay of μ-mesons supports

(i) Time dilation (ii) Length contraction (iii) relativity of mass (iv) Relativity of energy

Q.6 Effective mass of e^- depends on

(a) Electron concentration of conduction band

(b) Hole concentration of valance band

(c) Curvature of conduction band

(d) Width of valance band

Q.7 The forbidden energy gap of carbon in diamond structure is

(a) 0.7 ev (b) 1 ev (c) 0.01ev (d) None of these

Q.8 The Fermi level in an n-type semiconductor at OK lies

(a) Below the donor level

(b) Half way between the conduction band and donor level

(c) Coincides with intrinsic Fermi level

(d) None of these

Q.9 The density of carriers in a pure semiconductor is proportional to

(a) Exp ($-Eg/K_BT$) (b) Exp ($-2Eg/K_BT$)

(c) Exp ($-Eg/K_BT^2$) (d) Exp ($-Eg/2K_BT$)

Q.10 The depletion region in an open circuited p-n junction contains

(a) Electrons (b) Holes

(c) Uncovered immobile impurity ions

(d) Neutralized impurity atoms

Section-B

8x2 = 16

Attempt any two questions

Q.1 (a) Show from Lorentz transformation that two events simultaneous ($t_1=t_2$) at different positions ($x_1 \neq x_2$) in a reference frame S are not simultaneous in another reference frame. 4

(b) Show that the relativistic the form of Newton's second low, when **F** is parallel to **v** is 4

$$\vec{F} = m d\vec{v} / dt(1 - v^2/c^2)^{-3/2}$$

Q.2 (a) Prove the relation $E^2-p^2c^2 = m_o^2c^4$ where p is the momentum. 4

(b) Verify the statement that no particle can attain a velocity larger than velocity of light c . 4

Q.3 (a) what are donor and acceptor impurities. Give an example of each. 2+2+1+1

(b) Show the position of donor and acceptor level in an intrinsic semiconductor with suitable diagram. 2

Section C

Attempt any one question

Q.1 Deduce Einstein's mass-energy relation $E=mc^2$ and discuss it. Give some evidence showing its validity. 14x1 = 14

Q.2(a) Distinguish between intrinsic and extrinsic semiconductor obtain an expression for the carrier concentration for an intrinsic semiconductor. 7

(b) What is Hall effect. Obtain an repression for Hall coefficient. 7