2316 120

Class – B.Sc. (Sem - II)

Subject – Physics

Paper –A (Relativity and Electromagnetism)

Time Allowed : 3 Hours Maximum Marks : 35

Attempt five questions in all, selecting one question from each of section B, C, D and E. Section A is compulsory.

SECTION - A (Compulsory)

Attempt ALL questions. Each question carries 1 mark.

1. (a) What is Lorentz - Fitzerald contraction?

   (b) Define Lorentz force.

   (c) Coils in resistance box are made of double up insulated wires. Why?

   (d) Write down the relation between impedance and refractive index.

   (e) Show that rest mass of photon is zero.

   (f) Why inductance is called electrical inertia?

   (g) The factor $\frac{1}{\sqrt{\mu \in}}$ has dimensions of velocity. Justify.

$7 \times 1 = 7$

SECTION - B

2. (a) State fundamental postulates of special theory of relativity. 2

   (b) Derive law of addition of velocities using special

theory of relativity and then show that particle cannot move with a velocity greater than velocity of light. 5

OR

(a) Derive $E = mc^2$ 4

(b) Discuss the concept of time dilation. 3

Section - C

(a) State and write Biot - Savart Law in Vector form. 2

(b) Derive an expression for the magnetic field due to straight current carrying conductor. 5

OR

(a) State and prove Ampere 's Circuital Law. 3

(b) Derive an expression for magnetic field due to long current carrying solenoid. 4

SECTION - D

4. (a) State and prove Reciprocity theorem. 5

(b) Differentiate between series LCR circuit and parallel LCR circuit. 2

OR

(a) Define power factor of an A.C. circuit. 2

(b) Find impedance and phase of series LCR circuit and show that it is minimum at resonance frequency. Also discuss how the current in LCR circuit varies with frequency of source. 5

SECTION - E

5. (a) Define Skin Depth. Can e.m. wave penetrate through perfect conductor? 2

(b) Define Poynting vector and then prove that power flux through a closed area is equal to rate of out-flow of energy from volume enclosed by area. 5

OR

(a) Prove that e.m. waves are transverse in nature. 2

(b) Derive wave equations for plane polarised e. m. wave in medium having finite permittivity, permeability and conductivity. 5

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