Exam. Code : 103202

Subject Code : 1309

B.A/B.Sc. Semester—II

PHYSICS

Paper—A (Relativity and Electromagnetism)

Time Allowed—3 Hours]　　　　[Maximum Marks—35

Note :— There are **FIVE** Sections in total. Section A is compulsory. Attempt **ONE** question each from Sections B, C, D and E.

SECTION—A

I.　(i)　Two photons approach each other. What is their relative velocity ?

　　(ii)　What is Minkowski space ?

　　(iii)　State the condition under which magnetic scalar potential can exist.

　　(iv)　Calculate magnetic field at distance of 5 cm from an infinite straight conductor carrying current of 100 A.

　　(v)　What do you mean by displacement current ?

　　(vi)　Define inductance and give unit of coefficient of self induction.

　　(vii)　Can em wave propagate in a conductor ?

$1 \times 7 = 7$

2541(2416)/QFV-51544　　　　1　　　　**(Contd.)**

SECTION—B

II. Explain mathematically, Einstein's mass–energy equivalence. Explain physical significance of this relation. Mention two nuclear phenomena supporting this relation.　　7

III. Discuss length contraction and time variation on the basis of Lorentz transformations.　　7

SECTION—C

IV. (a) Compare and contrast Biot-Savarat's law and Coloumb's law.　　3

　　(b) What is vector potential ? Calculate it for a current loop at a point far away from the loop.　　4

V. Derive transformation equations of magnetic field from one inertial frame of reference to another.　　7

SECTION—D

VI. State and prove Reciprocity Theorem.　　7

VII. (a) Explain the concept of displacement current and derive an expression for the same in a region where electric field is changing with time.　　4

　　(b) What is Q-factor and find it for parallel resonant circuit ?　　3

SECTION—E

VIII. State Maxwell's equations for electromagnetism in free space, discussing each critically. What information do these equations furnish with regard to electromagnetic nature of light ? 7

IX. Derive an expression for reflection and transmission coefficients for em wave incident normally on the boundary of two media having different impedances.

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