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

5. (a) Find an expression for power consumed in an a.c. circuit containing L, C and R.

   (b) Define quality factor of a resonance circuit. Calculate the value for a parallel resonance circuit.

6. (a) State and prove the reciprocity theorem of mutual induction.

   (b) State and explain Maxwell's equation for electromagnetism in vacuum.

7. Prove that electromagnetic waves are transverse in nature.

8. (a) Derive an expression for poynting theorem of em waves and equation of continuity.

   (b) Show that energy flux in a plane polarized em wave in free space is the energy density times the velocity of the wave.

B.A./B.Sc. 2nd Semester

PHYSICS

Paper–A (Relativity and Electromagnetism)

Time Allowed—2 Hours]   [Maximum Marks—35

Note :— There are *eight* questions of equal marks. Candidates are required to attempt any *four* questions.

1. (a) Obtain relativistic formula for the addition of velocities and prove that a particle cannot travel with velocity more than the velocity of light.

   (b) A particle is moving with velocity of 0.9C in frame S' which itself is moving with velocity 0.9C w.r.t. frame S. What is the velocity of the particle in frame S ?

2. Derive expression for the transformations obeyed by the three components of momentum and energy.

3. What is Biot Savarat law ? Derive an expression for the magnetic field $\vec{B}$ due to solenoid.