B.Sc Part - I

EINSTEIN'S POSTULATES

The absence of any fringe shift in the Michelson - Morely experiment for any orientation of the interferometer and for any time of the year negated the ether hypothesis for light propagation. Light waves are oscillation of the electromagnetic field and no propagation medium is necessary, unlike sound waves. However, if Galilean transformation are correct, then maxwell's equations must be modified for every possible reference frame to account for different velocities for the speed of light. Einstein assumed the opposite that maxwell's equation are fundamentally correct but that our intuitive Galilean transformation is not. This led to the following two postulates.

1) The laws of physics ~~need~~ including electromagnetism, are the same in all inertial frames.

2) Every observer measures the same value c for the speed of light in all inertial frames.

The second postulate is really a consequence of the first because if Maxwell's equation hold in all inertial frames, then the only possible value for the speed of light is c. These postulates embody Einstein's special theory of relativity

First published in 1905 in a paper titled on the electrodynamics of moving bodies. Later he would incorporate gravity and acceleration in his General theory of relativity. As in Newtonian Relativity, there is no way to detect absolute motion. only the relative velocity between two inertial reference frames matters.

These seemingly simple postulates have extraordinary consequences. For example when you turn on the headlights of a car, the light beam leaves the car at a relative velocity of $c = 3.0 \times 10^8$ m/s. However, someone standing on the side walk also measures the speed of the light beam as c independent of the velocity of the car. How can this be? As we shall see, our concepts of space and time must be modified.