**Assignment 1.**

**Relativistic Mechanics**

1. State the fundamental postulates of special theory of relativity and derive Lorentz transformation equations.
2. What was the objective and outcome of Michelson Morley experiment? Describe the experiment and interpret the negative result.
3. Deduce the relativistic velocity addition theorem and show that its consistent with Einstein’s second postulates ie speeds of light is invariant in free space.
4. Derive the expression for the variation of mass with velocity.
5. Derive the formula for length contraction and time dilation. Discuss proper length and proper time interval. Write experimental verification of time dilation.
6. Deduce Einstein’s mass energy relation. Give some evidence showing its validity.
7. Write short notes on the following.
8. Inertial and non inertial frame of reference.
9. Mass less particles and show that the rest mass of photon is zero
10. ACCELERATION is invariant under Galilean transformation.
11. No matter can travel faster than speed of light.
12. Calculate the percentage contraction of a rod moving with a velocity 0.8c in a direction inclined at 600 to its own length.
13. A clock keeps correct times with what speeds should it be move relative to an observer so that it may appear to lose 4 minute in 24 hours?
14. Two particles came towards each other with speed 0.7c with respect to laboratory. What is their relative speed?
15. How fast must an electron move in order that it’s mass equal to the rest mass of proton?
16. Calculate the rest mass, relativistic mass and momentum and kinetic energy of photon and electron of energy 2 MeV.
17. A particle of rest mass m0 moves with speed of Calculate its mass, momentum, total energy and kinetic energy.
18. A cube with its sides of proper lo is moving with uniform velocity v, parallel to an edge of the cube. Deduce the expression for the volume of the cube for the observer. Write new shape of cube.
19. If the kinetic energy of a body is twice its rest mass energy. Calculate its velocity.
20. Find the speed of 0.1MeV electron according to classical and relativistic mechanics.
21. Derive:
22. F = mo
23. is invariant under Lorentz transformation.