1. An object makes circular motion in the x-y plane with angular velocity ω and radius R. Calculate the trajectory and velocity of the object observed by a moving observer at velocity V along the x-axis.
2. A red light and a blue light are fixed at the two ends of a 100m–long train, respectively. A person on the train observes the red light flashes then after 10^{-6} sec the blue light flashes. A person on the ground, on the other hand, observes the two lights to flash at the same time. What is the velocity and direction of the train?
3. A red light and a blue light are fixed on the ground separated by 100m. A person on the train observes the two lights flash at the same time. A person on the ground, on the other hand, observes the red light flashes first, and then after 10^{-6} sec the blue light flashes. What is the velocity and direction of the train?
4. A particle has a momentum of 3000MeV/c and total energy of 6000MeV, what is its rest mass?
5. A particle with rest mass m_0 and velocity u collides with another particle with mass $2m_0$ and velocity $-u$ and merge into a big particle. What is the mass and velocity of the big particle? If the observer is moving at a velocity $V = u$, what would be the observed mass and the velocity of the two colliding particles and the resulting particle?