B.Sc I Sem Series Test - I

Marks: 50

Date: 12/03/2022

PHYSICS

I. Answer all the following. (12 X 4 = 48 m)

1. (a) What is center of mass? Derive an expression for position, velocity, acceleration & force for center of mass. (8m)

(b) State & prove the law of conservation of linear momentum for a system of particles. (4m)

2. (a) Define Elastic collision? Derive the eq^{n} for velocities in (i) Laboratory frame of reference. (ii) Center of mass frame of reference. (8m)

(b) A sand bag of mass 10 kg is suspended with a long weightless string. A bullet of mass 0.2 kg is fired with a speed of 20 ms^{-1} into the bag & stays in the bag. Calculate the speed acquired by the bag? (4m)

3. (a) What is Rocket? State its principle. Derive an expression for the final velocity of the Rocket. (8m)

(b) State & Prove Law of conservation of Angular momentum. (4m)

4. (a) State & Prove Law of conservation of energy. (6m)

(b) Derive relation b/w torque & angular momentum (3m)

(c) A Rocket starts from rest with exhaust velocity of gases equal to 1.2 kms^{-1}. Calculate the velocity attained by the Rocket when its mass is reduced to $\frac{1}{20}^{th}$ of its initial mass. (3m)