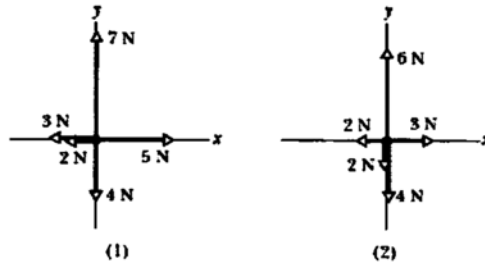




Q.1. Give short answers of the following. (15x2=30)

- i. What do you mean by co-efficient of static friction?
- ii. What is Coriolis effect?
- iii. Fig. gives the free-body diagram for four situations in which an object is pulled by several forces across a frictionless floor, as seen from overhead. In which situations does the acceleration a of the object have (a) an x component and (b) a y component? (c) In each situation, give the direction of a by naming either a quadrant or a direction along an axis.



- iv. How would you differentiate between inertial and non-inertial frames?
- v. Distinguish between elastic collisions, inelastic collisions, and completely inelastic collisions
- vi. Define conservative and non-conservative forces
- vii. What do you understand by conservation of angular momentum?
- viii. A body of mass 4.5g is dropped from rest at a height of 10.5m above surface of earth. What will be its speed just before it strikes the ground?
- ix. If a solid sphere, disc and cylinder are allowed to roll down an inclined plane from the same height, which one among these will reach the bottom first?
- x. Specify the conditions of static equilibrium.
- xi. What type of motions are involved in rolling an object?
- xii. How would you calculate the angular momentum of system of particles?
- xiii. Define third law force pair of gravitation?
- xiv. Define isolated system
- xv. State parallel-axis theorem

Answer the following questions. (3x10=30)

Q.2. (a) For isolated elastic collisions in one dimension, apply the conservation laws for both the total energy and the net momentum of the colliding bodies to relate the initial values to the values after the collision (6 Marks)

(b) A 2.00 kg particle has the xy coordinates (-1.20 m, 0.500 m), and a 4.00 kg particle has the xy coordinates (0.600 m, -0.750 m). Both lie on a horizontal plane. At what (a) x and (b) y coordinates must you place a 3.00 kg particle such that the center of mass of the three-particle system has the coordinates (-0.500 m, -0.700 m)? (4 Marks)

Q.3. (a) State and prove parallel axis theorem (6 Marks)

(b) Consider a thin, uniform rod of mass M and length L , on an x -axis with the origin at the rod's center. Calculate the rotational inertia of the rod about the perpendicular rotation axis through the center? (4 Marks)

Q.4. (a) When work is done on a system by an external force with no friction involved, determine the changes in kinetic energy and potential energy. (5 Marks)

(b) State three Kepler's law of planetary motion and prove Kepler's law of areas. (5 Marks)