Q1. Attempt all   **(6)**

a) Show that   when no central force acts on a body, the acceleration of the centre of mass is zero and its velocity is constant.

b) The position of a moving particle at any instant is given by $r = 3\cos\theta\,\hat{\imath} + 3\sin\theta\hat{\jmath}$

   Show that the force acting on it is conservative one.

c) Suppose a particle is moving along a curve whose parametric equations is

   $x = 40t^2 + 8t$; $y = 2\cos 3t$; $z = 2\sin 3t$. Determine its velocity and acceleration at $t = 0$ sec.

Q2. (a) What is simple pendulum. Derive the differential equation for simple pendulum having mass m and length l . What are the drawbacks of simple pendulum.   **(5)**

   (b) What are elastic and inelastic collisions.   **(2)**

Q3. (a) Deduce an expression for the moment of inertia of a rectangular lamina of length l and width b about an axis through its centre and parallel to one side . Hence also find the moment of inertia about an axis coinciding with one side.

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