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Official telegram channel !

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Part One: - *Short Answer. Give Your Short and Precise Answer. (15%)*

1. If the component of vector $\vec{A}$ along the direction of vector $\vec{A}$ is zero, (3pt)
   a. What can you conclude about the two vectors?

   b. What is the area of the parallelogram formed by vectors $\vec{A}$ and $\vec{B}$.

2. A footballer kicks a ball at an angle θ to the horizontal with some initial velocity $\vec{v}_0$. (4pt)
   a. What are the two types of independent motions takes place at the same time?

   b. What are the characteristic features of each motion? (Be specific on their acceleration and net force), assume that, air resistance is neglected.

   c. How long is the ball in the air?

   d. How far the ball moves to the horizontal?

3. Explain the following basics. (5pt)
   a. Inertia.

   b. Conservative and non-conservative forces.

   c. Centre of mass of an object. Can it be located at a position at which there is no mass? I
   so, give examples.

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d. The law of conservation of energy

4. Let an object is moving by a uniform velocity of v for t time interval. Then, (3pt)
   a. What is the change in momentum between any two points in its way?

   b. What about the impulse on an object?

Part Two: *- Work Out. Show all the necessary steps explicitly.*

1. A block of ice with mass 6.00 kg is initially at rest on a frictionless, horizontal surface. A worker then applies a horizontal force F to it. As a result, the block moves along the x-axis such that its position as a function of time is given by (5pt)
   $x(t) = \alpha t^2 + \beta t^3$, *where* $\alpha = 0.200\ ^{m}/_{s^2}$ *and* $\beta = 0.0200\ ^{m}/_{s^3}$
   a. Calculate the velocity of the object when t = 4.00 s.

c. The tension in the string, and

3. A projectile of mass $m_1 = m$ moving along the $x-$ direction with a speed $v_1 = 10\sqrt{3}\ m/s$ collides elastically with a stationary target of mass $m_2 = 2m$. After the collision, the projectile is deflected at an angle of 90^0, as shown in Fig. below.

a. What is the speed and angle of the target after collision?

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