

EASTERN UNIVERSITY, SRI LANKA
FIRST EXAMINATION IN SCIENCE - 2011/2012
FIRST SEMESTER (PROPER/REPEAT)
(February 2014)
PH 101 MECHANICS I

Time: 01 hour.

Answer ALL Questions

1. (a) Define the terms instantaneous velocity and instantaneous acceleration of a particle.

Instantaneous acceleration of a particle is given by $a = 3t^2\vec{i} + 4t\vec{j} + 5\vec{k}$ where a is in $msec^{-2}$ and t is in sec.

- (i) What is the acceleration of the particle when $t = 1sec$.
- (ii) If the particle has a velocity $(\vec{i} + \vec{j} + \vec{k})m sec^{-1}$ at $t = 0$ determine the instantaneous velocity of the particle.
- (iii) The particle is located at $(1,2,3)$ at $t = 0$. What is the displacement of the particle at $t = 2 sec$.

(b) A particle moves in two dimension and its position is given by the polar coordinates (r, θ) . It moves along the curve $r = 3\theta$ and $\theta = t^2$.

- (i) Find the radial and transverse components of the velocity and acceleration of the particle.

- (ii) What is the velocity of the particle when $\theta = \frac{\pi}{3}$?

2. State Newton's second law and hence introduce the concept of impulse and conservation of momentum.

A billiard ball with a velocity of $0.50 ms^{-1}$ collides head-on with another billiard ball of equal mass coming from the opposite direction with a velocity of $0.80 ms^{-1}$. If the collision is elastic, what are the velocities of the two balls after they collide?