

Motion in one dimension

Assignment 2

Question -1

A bus start at Station A from rest with uniform acceleration 2m/sec^2 . Bus moves along a straight line

1. Find the distance moved by the bus in 10 sec?
2. At what time, it velocity becomes 20m/sec ?
- 3 How much time it will take to cover a distance of 1.6km

Question -2

A object is moving along an straight line. The motion of that object is described by $x=at+bt^2+ct^3$

where a, b, c are constants and x is in meters and t is in sec.

1. Find the displacement at $t=1$ sec
2. Find the velocity at $t=0$ and $t=1$ sec
3. Find the acceleration at $t=0$ and $t=1$ sec

Question 3

An object is thrown vertically upward with an initial velocity of 40m/s . Two second later another object is thrown upward with the same velocity

Find out following

1. At what height they meet
2. what is the time when they meet
3. what are the velocities of each object when they meet

Question 4

A particle moves along the x -axis according to the following equation

$$x=pt(1-qt) \quad \text{where } p \text{ and } q \text{ are constants and } p > 0, q > 0.$$

Let take \mathbf{i} as the unit vector across x -axis

- 1 Find out the velocity and acceleration vector for the particle
2. What time it will reach its initial point and what will be the total distance traversed

Question 5

A Balloon rises from rest on the ground vertically upwards with a constant acceleration $g/8$. An object is dropped from the balloon when it has risen to the height h .

Find out the time taken by the object to reach the ground.

Question 6

A Police Motorcycle is moving on a highway with a speed v_m fires a bullet at a thief motorcycle speeding away in the same direction with a speed v_t ($v_t > v_m$). If the muzzle speed of the bullet is v_b ($v_b > v_t - v_m$) find out the following

1. What is the speed of the bullet with respect to the observer sitting on the ground?
2. What speed will the bullet hit the thief
- 3 What will the speed of the bullet with respect to another police motorcycle moving in the same direction at a speed of v

Question 7

A nut comes loose from a bolt on the bottom of the elevator as the elevator is moving up the shaft at 3 m/s. The nut strikes the bottom of the shaft in 2 sec

Find out the following

- How far from bottom of the shaft was the elevator when the nut fell off?
- How far above the bottom of the shaft was the nut .25 sec after the fell off.?
- How far above the bottom of the shaft was the elevator when the nut fell on the ground?
- At what height above the bottom of the shaft, nut has zero velocity after the fell off?
- what is the total distance travelled by nut in it motion after the fell off?

Given $g=9.8 \text{ m/s}^2$