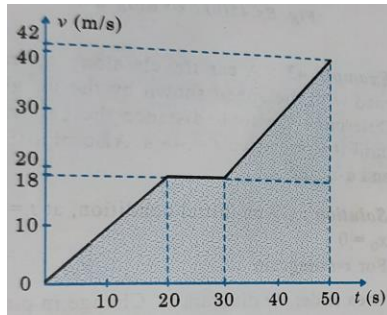
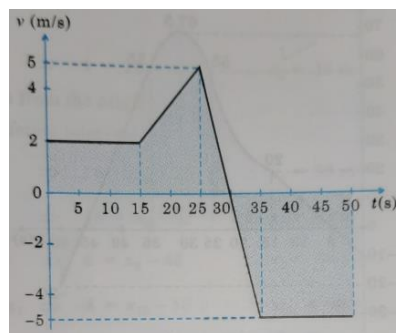


Class work problems on module 2.1 (Rectilinear motion) - 2024

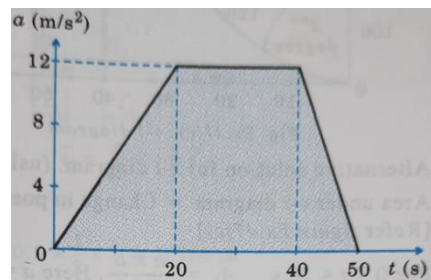
1. A particle has a straight line motion given by the equation $x = (t^3 - 2t^2 - 4)$ m, where t is in seconds. What is the change in displacement when velocity changes from 4 m/s to 32 m/s?
2. During a test, the car moves in a straight line such that its velocity is defined by $v = 0.3(9t^2 + 2t)$ m/s, where t is in seconds. Determine the position and acceleration when $t = 3$ seconds. Given at $t = 0$, $s = 0$.
3. A sphere is fired downward into a medium with an initial speed of 27 m/s. Sphere experiences a deceleration $a = -6t$ m/s², where t is in seconds, determine the distance travelled before it comes to rest.
4. The acceleration of an oscillating particle is defined by the relation $a = -kx$. Determine (a) the value of k such that $v = 15$ m/s when $x = 0$, and $v = 0$ when $x = 3$ m (b) the speed of the particle when $x = 2$ m.
5. The acceleration of a particle is defined by the relation $a = -60x^{-1.5}$. Knowing that particle starts from rest from a position $x = 4$ m, find the velocity of the particle when (a) $x = 0.5$ m (b) $x = 1.5$ m and the (c) position of the particle when velocity is 10 m/s.
6. The acceleration of a particle is defined by the relation $a = k[1 - e^{-x}]$. Knowing that $v = 6$ m/s when $x = -2$ m, and particle comes to rest at origin, determine (a) value of k (b) velocity of the particle when $x = -1$ m.
7. A rectilinear motion of a car is governed by the equation $a = \left[\frac{8}{1.5v+2} \right]$ m/s², where v is in m/s. Assuming that the car starts from rest, find the time taken and distance covered by the motor car to attain the velocity of 8 m/s.
8. In an Asian games event of 100 m run, an athlete accelerates uniformly from the start to his maximum velocity in a distance of 4 m and runs the remaining distance with that velocity. If the athlete completes the race in 10.4 s, determine (a) his initial acceleration (b) his maximum velocity.
9. The race car starts from rest and travels along a straight road until it reaches a speed of 42 m/s in 50 seconds as shown by v - t graph. Determine the distance travelled by the race car in 50 seconds. Draw x - t and a - t graph.



10. The v - t diagram for a particle moving along straight line is shown in fig. Knowing that $x = -10$ m at $t = 0$ (a) Plot x - t and a - t diagram for $0 < t < 50$ s. (b) Determine the maximum value of position coordinate and the value of t for which the particle is at a distance of 55 m from the origin.



11. Fig. shows a plot of a v/s t for a particle moving along x -axis. What is the speed and distance covered by the particle after 50 sec? Find also the maximum speed and time at which the speed attained by the particle. Draw v - t and x - t diagram.



12. For the a - t diagram of particle shown in fig. draw v - t and x - t diagram. Also calculate the velocity at the end of 3 sec and distance travelled in 4 sec. Assume that particle starts from rest from origin.

