**1.** A particle is moving eastward with a velocity of 5m/s In 10 s, the velocity changes to 5m/s northward. Find the average acceleration in this time.

(A) zero (B) $\frac{1}{\sqrt{2}}$ m/s$^2$ towards north-west

(C) $\frac{1}{\sqrt{2}}$ m/s$^2$ towards north-east (D) $\frac{1}{2}$ m/s$^2$ towards north-west

**2.** A boy walks to his school at a distance of 6 km with a speed of 2.5 km/h, and walks back with a constant speed by 4 km/h.Find his average speed for trip expressed in km/h.

(A) $\frac{24}{13}$ (B) $\frac{40}{13}$ (C) 3 (D) 4.8

**3.** If the distance 's' travelled by a body in time 't' is given by $s = \frac{a}{t} + bt^2$ then the acceleration equals

(A) $\frac{2a}{t^3} + 2b$ (B) $\frac{2s}{t^2}$ (C) $2b - \frac{2a}{t^3}$ (D) $\frac{s}{t^2}$

**4.** A particle moves such that its position $x$ varies with time according to relation $x = 2t - t^2$, where $x$ is in metres and time in seconds. The incorrect statement about the particle is

(A) Velocity of the particle in interval $t = 0$ to $t = 2$ sec is in positive $x$-direction.

(B) Speed of the particle is 1 m/s at $t = \frac{3}{2}$ s.

(C) Displacement travelled in the interval $t = 0$ to $t = 2$s is zero.

(D) Its speed first increases then decreases.

**5.** The velocity of a particle traveling in a straight line is given by $v(t) = 5 - 6e^{-t/2}$ m/s, where time t is in seconds and $t \geq 0$. If the particle is observed at x=7m at the instant t = 0, its position x is expressed as function of time $x(t) = kt + le^{-t/2} + m$. Find numerical value of $\frac{k+m}{\ell}$.

**6.** A particle is moving in a straight line according to equation $x = \frac{t^3}{3} - \frac{5}{2}t^2 + 6t$. The time interval in which velocity i.e. instantaneous rate of change of position w.r.t. time is negative is

(A) $0 < t < 3$ (B) $0 < t < 2$ (C) $2 < t < 3$ (D) $t > 3$ and $t < 2$

**7.** The position of a particle varies according to the expression $x = t(t - 1)(t - 2)$ then

(A) Velocity will be zero at $t_2 = 1 - \frac{1}{\sqrt{3}}$ second that $t_2 = 1 + \frac{1}{\sqrt{3}}$ sec

(B) Acceleration changes its direction between $t_1 = 0$ and $t_2 = 2$

(C) Acceleration remains constant in direction between $t_1 = 0$ and $t_2 = 2$

(D) None of these

**8.** A scooter going due east at 10 m s$^{-1}$ turns right through an angle of 90°. If the speed of the scooter remains unchanged in taking this turn, the change in the velocity of the scooter is :

(A) 20.0 m s$^{-1}$ in south-western direction (B) zero

(C) 10.0 m s$^{-1}$ in south-east direction (D) 14.14 m s$^{-1}$ in south-western direction

**9.** The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The acceleration at time t of the particle will be equal to zero, where t is equal to :–

(A) $\frac{2a}{3b}$ (B) $\frac{a}{b}$ (C) $\frac{a}{3b}$ (D) zero

**10.** A particle moves along a straight line such that its displacement at any time t is given by $s = t^3 - 6t^2 + 3t + 4$ metres. The velocity when the acceleration is zero is

(A) $3ms^{-1}$ (B) $-12ms^{-1}$ (C) $42\ ms^{-1}$ (D) $-9ms^{-1}$

**11.** The displacement of a particle starting from rest (at t = 0) is given by $s = 6t^2 - t^3$ The time at which the particle will attain zero velocity again, is

(A) 4s (B) 8s (C) 12s (D) 16s

**12.** A car moves along a straight line whose equation of motion is given by $s = 12t + 3t^2 - 2t^3$where s is in metres and t is in seconds. The velocity of the car at start will be :–

(A) 7 m/s (B) 9 m/s (C) 12 m/s (D) 16 m/s

**13.** Velocity of a body moving in a straight line is $v = (t^2 + 2t+1)$ kg m/s. Acceleration of the body at t = 2 s is

(A) $6\ ms^{-2}$ (B) $8\ ms^{-2}$ (C) $4\ ms^{-2}$ (D) $2\ ms^{-2}$

**14.** The displacement of a body is given to be proportional to the cube of time elapsed. Acceleration of the body is proportional to :

(A) $t^4$ (B) $t^3$ (C) $t^2$ (D) t

**15.** A point moves rectilinearly. Its position x at time t is given by $x^2 = t^2 + 1$. Its acceleration at time t is:

(A) $\frac{1}{x^3}$ (B) $\frac{1}{x} - \frac{1}{x^2}$ (C) $-\frac{t}{x^2}$ (D) none of these

**16.** The initial velocity of a particle is u and the acceleration is given by (kt), where k is a positive constant. The distance travelled in time t is :

(A) $s = ut^2 + kt^2$ (B) $s = ut + (kt^3/6)$ (C) $s = ut + (kt^3/2)$ (D) $s = (ut^2/2) + (kt^3/6)$

**17.** A body starts from the origin and moves along the X-axis such that the velocity at any instant is given by $4t^3 - 2t$, where *t* is in sec and velocity in $ms^{-1}$. What is the acceleration of the particle, when it is 2 m from the origin

**18.** A particle has a velocity of $v = 8 - 2t\ ms^{-1}$ and moves in a straight line. It is at origin at t = 0. When will it pass through the origin again.

**19.** A particle has a velocity of $v = 10 - 2t\ ms^{-1}$ and moves in a straight line.Find the distance traveled in 10 s

**20.** A particle has an acceleration $a = 10 - 5t\ ms^{-2}$ and moves in a straight line initially at rest (a) Find the velocity after 4 s (b) Find the distance traveled in 6 s (c) draw the v-t graph.

**21.** A particle has an acceleration $a = 4\sqrt{x}\ ms^{-2}$ and moves in a straight line with zero velocity at x = 0. Find the velocity of the particle at x = 1.

**22.** A particle has an acceleration $a = -2x\ ms^{-2}$ and moves in a straight line with velocity 4 m/s at x = 0.Find the value of x at which it stops.

**23.** Velocity of a particle varies with position as per the equation $v = \frac{1}{x}$. At t = 0 the position is 2 m. Find the position at t = 1 s.

**24.** A particle is given velocity of 5 m/s and its acceleration is $a = -2v$, where *v* is its velocity at any time *t*. Find the velocity v at any time *t*. Also find the total distance travelled.

**25.** A particle starts and has acceleration $a = 5 - 2v$, where *v* is its velocity at any time *t*.Find the velocity v at any time. Also find the terminal velocity.

# Answers

## RACE # 08

**1.** (B) **2.** (B) **3.** (A) **4.** (A) **5.** 0 **6.** (C) **7.** (B) **8.** (D) **9.** (C) **10.** (D)
**11.** (A) **12.** (C) **13.** (A) **14.** (D) **15.** (A) **16.** (B) **17.** 22 $ms^{-2}$ **18.** 8 sec.

**19.** 50 m **20.** (a) zero, (b) $\frac{160m}{3}$ **21.** $\frac{4}{\sqrt{3}} m/s$ **22.** $2\sqrt{2} m/s$ **23.** $\sqrt{6}$ m

**24.** $v = 5e^{-2t}$, 2.5 m **25.** $v = 5/2\ (1 - e^{-2t})$, 2.5 m/s