All Branches Hinglish

Subject: Engineering Mathematics DPP-01
Chapter: Vector Calculus
Topic : Basics of Vector & DEL operator

1. The angle θ_{AB} between the vectors
   $A = 3a_x + 4a_y + a_z$ and $B = 2a_y - 5a_z$ is nearly
   (a) 83.7°   (b) 73.7°
   (c) 63.7°   (d) 53.7°

2. The angle between two vectors $x_1 = [2\ 6\ 14]'$ and $x_2 = [-12\ 8\ 16]'$ in radian is ___.

3. The smaller angle (in degrees) between the planes $x + y + z = 1$ and $2x - y + 2z = 0$ is _____.

4. Consider the time-varying vector $I = \hat{x}15\cos(\omega t) + \hat{y}5\sin(\omega t)$ in Cartesian coordinates, where. $\omega > 0$ is a constant. When the vector magnitude |I| is at its minimum value, the angle θ that I makes with the x axis (in degrees, such that $0 < \theta < 180$) is _____.

5. A particle move along a curve whose parametric equations are: $x = t^3 + 2t$, $y = -3e^{-2t}$ and $z = 2\sin(5t)$, where x, y and z show variations of the distance covered by the particle (in cm) with time t (in s). The magnitude of the acceleration of the particle (in cm/s^2) at $t = 0$ is _____.

6. If P, Q and R are three points having coordinates (3, –2, –1), (1, 3, 4), (2, 1, –2) in XYZ space (O being the origin of the coordinate system) then distance of point P from plane OQR is)
   (a) 3   (b) 7
   (c) 5   (d) 9

7. A particle, starting from origin at $t = 0$s, is traveling along axis with velocity
   $$V = \frac{\pi}{2}\cos\left(\frac{\pi}{2}t\right)\text{m/s}$$
   At $t = 3$s, the difference between the distance covered by the particle and the magnitude of displacement from the origin is _____.

8. If $\vec{a}$ and $\vec{b}$ are two arbitrary vectors with magnitudes a and b, respectively, $\left|\vec{a} \times \vec{b}\right|^2$ will be equal to
   (a) $a^2b^2 - \left(\vec{a} \cdot \vec{b}\right)^2$
   (b) $ab - \vec{a} \cdot \vec{b}$
   (c) $a^2b^2 + \left(\vec{a} \cdot \vec{b}\right)^2$
   (d) $ab + \vec{a} \cdot \vec{b}$

Answer Key

1. (a)
2. (0.65 to 0.8)
3. (54.73)
4. (90)

5. (12)
6. (a)
7. (2)
8. (a)