MATHEMATICS
DPP
DAILY PRACTICE PROBLEMS

DPP No. 55

Total Marks : 31

Max. Time : 33 min.

Topics : Application of Derivatives, Solution of Triangle, Vector

Type of Questions		M.M. Min.
Single choice Objective (no negative marking) Q.1,2,3,4	(3 marks, 3 min.)	[12, 12]
Assertion and Reason (no negative marking) Q.5	(3 marks, 3 min.)	[3, 3]
Subjective Questions (no negative marking) Q.6,7	(4 marks, 5 min.)	[8, 10]
Match the Following (no negative marking) Q.8	(8 marks, 8 min.)	[8, 8]

1. Let $\vec{a}$ = 2i + j – 2k and $\vec{b}$ = i + j. If $\vec{c}$ is a vector such that $\vec{a}.\vec{c} = |\vec{c}|$, $|\vec{c}-\vec{a}| = 2\sqrt{2}$ and the angle between $\vec{a}\times\vec{b}$ and $\vec{c}$ is 30° then $|(\vec{a}\times\vec{b})\times\vec{c}|$ is equal to:

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

2. Let the centre of the parallelopiped formed by $\overrightarrow{PA} = \hat{i} + 2\hat{j} + 2\hat{k}$; $\overrightarrow{PB} = 4\hat{i} - 3\hat{j} + \hat{k}$; $\overrightarrow{PC} = 3\hat{i} + 5\hat{j} - \hat{k}$ is given by the position vector (7, 6, 2). Then the position vector of the point P is:

(A) (3, 4, 1) (B) (6, 8, 2) (C) (1, 3, 4) (D) (2, 6, 8)

3. If $\vec{a}, \vec{b}, \vec{c}$ are coplanar vectors and $\vec{a}$ is not parallel to $\vec{b}$ then,

$\{(\vec{c}\times\vec{b}).(\vec{a}\times\vec{b})\}\,\vec{a} + \{(\vec{a}\times\vec{c}).(\vec{a}\times\vec{b})\}\vec{b}$ is equal to :

(A) $\{(\vec{a}\times\vec{b}).(\vec{a}+\vec{b})\}\vec{c}$ (B) $\{(\vec{a}\times\vec{b}).(\vec{a}\times\vec{b})\}\,\vec{c}$ (C) $\{(\vec{a}\times\vec{b}).(\vec{a}-\vec{b})\}\,\vec{c}$ (D) none of these

4. If g(x) = 2f $(2x^3 - 3x^2)$ + f $(6x^2 - 4x^3 - 3)$ $\forall$ x $\in$ R and $f''(x) > 0$, $\forall$ x $\in$ R, then g(x) is increasing in the interval

(A) $\left(-\infty, -\frac{1}{2}\right) \cup (0, 1)$ (B) $\left(-\frac{1}{2}, 0\right) \cup (1, \infty)$ (C) $(0, \infty)$ (D) none of these

5. **Statement-1 :** In any ΔABC, the minimum value of $\frac{r_1 + r_2 + r_3}{r}$ is equal to 9.

Statement-2 : In a ΔABC if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$, then $\frac{r_1 + r_2 + r_3}{r} = 9$.

(A) Statement-1 is correct and statement-2 is correct and statement-2 is correct explanation of statement-1
(B) Statement-1 and statement-2 both are correct but statement-2 is not correct explanation of statement-1
(C) Statement-1 is false but statement-2 is true
(D) Statement-1 is true but statement-2 is false
(E) Statement-1 and Statement-2 both are False.

6. A spherical iron ball 8 inch. in diameter is coated with a layer of ice of uniform thickness. If the ice melts at the rate of 10 inch^3/minute, how fast is the thickness of the ice decreasing when it is 2 inch. thick?

7. A circle with centre in the first quadrant is tangent to y = x + 10, y = x – 6, and the y-axis. Let (h, k) be the centre of the circle. If the value of (h + k) = a + b$\sqrt{a}$ (where (a, b $\in$ Q), find the value of a + b.

8. **Match the column**

Column - I	**Column - II**
(A) If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular vectors where $\lvert\vec{a}\rvert = \lvert\vec{b}\rvert = 2$ and $\lvert\vec{c}\rvert = 1$, then $\frac{1}{12}[\vec{a}\times\vec{b} \quad \vec{b}\times\vec{c} \quad \vec{c}\times\vec{a}]$ is	(p) $-\frac{3}{4}$
(B) If $\vec{a}, \vec{b}$ are two unit vectors inclined at $\frac{\pi}{3}$, then $[\vec{a} \quad \vec{b}+\vec{a}\times\vec{b} \quad \vec{b}]$ is	(q) 0
(C) If $\vec{b}, \vec{c}$ are orthogonal unit vectors and $\vec{b}\times\vec{c} = \vec{a}$, then $[\vec{a}+\vec{b}+\vec{c} \quad \vec{a}+\vec{b} \quad \vec{b}+\vec{c}]$ is	(r) $\frac{4}{3}$
(D) If $[\vec{x}\ \vec{y}\ \vec{a}] = [\vec{x}\ \vec{y}\ \vec{b}] = [\vec{a}\ \vec{b}\ \vec{c}] = 0$ each vector being a non-zero vector, and no two vectors are collinear then $[\vec{x}\ \vec{y}\ \vec{c}]$ =	(s) 1

Answers Key

1. (B) **2.** (A) **3.** (B) **4.** (B)

5. (B) **6.** $\frac{5}{72\pi}$ inch/minute

7. 10

8. (A) $\to$ (r) ; (B) $\to$ (p) ; (C) $\to$ (s) ; (D) $\to$ (q)