

Topics : Three Dimensional Geometry, Vector, Indefinite Integration

Type of Questions

M.M., Min.

Comprehension (no negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9, 9]
Single choice Objective (no negative marking) Q. 4, 5	(3 marks, 3 min.)	[6, 6]
Multiple choice objective (no negative marking) Q.6	(5 marks, 4 min.)	[5, 4]
Subjective Questions (no negative marking) Q.7, 8	(4 marks, 5 min.)	[8, 10]

COMPREHENSION (Q. NO. 1 TO 3)

Let two planes $P_1 : 2x - y + z = 2$ and $P_2 : x + 2y - z = 3$ are given.

- Equation of the plane which passes through the point $(-1, 3, 2)$ and is perpendicular to each of the planes P_1 and P_2 is
 (A) $x + 3y - 5z + 2 = 0$ (B) $x - 3y + 2z - 18 = 0$
 (C) $x - 3y - 5z + 20 = 0$ (D) $x - 3y + 5z = 0$
- The equation of the acute angle bisector of planes P_1 and P_2 is
 (A) $x - 3y + 2z + 1 = 0$ (B) $3x + 3y - 2z + 1 = 0$ (C) $x + 3y - 2z + 1 = 0$ (D) $3x + y = 5$
- The image of plane P_1 in the plane mirror P_2 is
 (A) $x + 7y - 4x + 5 = 0$ (B) $3x + 4y - 5z + 9 = 0$ (C) $7x - y + 2z - 9 = 0$ (D) None of above
- A mirror and a source of light are situated at the origin O and a point A on OX respectively. A ray of light from the source strikes the mirror and is reflected. If the direction ratios of the normal to the plane of mirror are 1, -1, 1, then direction cosines for the reflected ray are
 (A) $\frac{1}{3}, \frac{2}{3}, \frac{2}{3}$ (B) $-\frac{1}{3}, \frac{2}{3}, \frac{2}{3}$ (C) $-\frac{1}{3}, -\frac{2}{3}, -\frac{2}{3}$ (D) $-\frac{1}{3}, -\frac{2}{3}, \frac{2}{3}$
- $\int \frac{\sin^3 x \, dx}{(\cos^3 x + 3\cos^2 x + 1)\tan^{-1}(\sec x + \cos x)} =$
 (A) $\tan^{-1}(\sec x + \cos x) + c$ (B) $\ln \tan^{-1}(\sec x + \cos x) + c$
 (C) $\frac{1}{(\sec x + \cos x)^2} + c$ (D) none of these
- If \vec{b} is vector whose initial point divides the join of $5\hat{i}$ and $5\hat{j}$ in the ratio $k : 1$ and terminal point is origin and $|\vec{b}| \leq \sqrt{37}$, then the set of exhaustive values of k is
 (A) $\left[-6, -\frac{1}{6}\right]$ (B) $(-\infty, -6) \cup \left[-\frac{1}{6}, \infty\right)$ (C) $[0, 6]$ (D) $\left[-\frac{1}{6}, \infty\right)$
- Evaluate :
 (i) $\int \frac{(\tan^{-1} x)^3}{1+x^2} dx$ (ii) $\int \frac{3x^2+5}{x^2+4} dx$
- Find $\int \left(\left(\frac{x}{e} \right)^x + \left(\frac{e}{x} \right)^x \right) \ln x \, dx$

Answers Key

1. (C) 2. (A) 3. (C) 4. (D)

5. (B) 6. (B)(D)

7. (i) $\frac{(\tan^{-1} x)^4}{4} + C$ (ii) $3x - \frac{7}{2} \tan^{-1}\left(\frac{x}{2}\right) + C$

8. $\left(\frac{x}{e}\right)^x - \left(\frac{e}{x}\right)^x + c$