

## PART 1 - MATHEMATICS

Topic : Three dimensional geometry

## SECTION-A : (Maximum Marks : 24)

- This section contains **SIX** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :
 

|                |      |                                                                                                  |
|----------------|------|--------------------------------------------------------------------------------------------------|
| Full Marks     | : +4 | ONLY if (all) the correct option(s) is(are) chosen;                                              |
| Partial Marks  | : +3 | If all the four options are correct but ONLY three options are chosen;                           |
| Partial Marks  | : +2 | If three or more options are correct but ONLY two options are chosen, both of which are correct; |
| Partial Marks  | : +1 | If two or more options are correct but ONLY one option is chosen and it is a correct option;     |
| Zero Marks     | : 0  | If none of the options is chosen (i.e. the question is unanswered);                              |
| Negative Marks | : -1 | In all other cases.                                                                              |
- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. Let P be the plane such that it contains the straight line  $\frac{x-1}{2} = \frac{y-3}{3} = \frac{z+2}{1}$  and is perpendicular to the plane  $x + 2y + 3z = 4$ . Let  $P_1$  be the plane which passes through the point (4, 2, 2) and is parallel to P. Then which of the following statements is (are) TRUE ? [JEE Advanced 2026 Paper 1]

(A) The equation of the plane P is  $7x - 5y + z = -10$ (B) The distance between the planes P and  $P_1$  is 30(C) The distance of the plane P from the origin is  $2\sqrt{3}$ (D) The acute angle between the plane P and the plane  $2x + 2y + z = 3$  is  $\cos^{-1}\left(\frac{1}{3\sqrt{3}}\right)$ 

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2. Let L be the straight line joining the points P(1,2, - 1) and Q(2,3,1). Let S be the foot of the perpendicular drawn from the point R(4, - 1,5) to the line L. Another line passing through R intersects L at a point T such that the point S divides the line segment PT internally in the ratio  $|PS|:|ST| = 1:2$ , where  $|PS|$  and  $|ST|$  are the lengths of the line segments PS and ST, respectively. Then which of the following statements is (are) TRUE ? [JEE Advanced 2026 Paper 2]

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- (A) The orthocentre of the triangle PRT is  $\left(\frac{23}{5}, -4, \frac{31}{5}\right)$   
 (B) The orthocentre of the triangle PRT is (4,3,5)  
 (C) The area of the triangle PRT is  $6\sqrt{5}$   
 (D) The area of the triangle PRT is  $18\sqrt{5}$

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3. Let  $L_1$  be the line of intersection of the planes given by the equations  $2x + 3y + z = 4$  and  $x + 2y + z = 5$ .

Let  $L_2$  be the line passing through the point  $P(2, -1, 3)$  and parallel to  $L_1$ . Let  $M$  denote the plane given by the equation

$$2x + y - 2z = 6.$$

Suppose that the line  $L_2$  meets the plane  $M$  at the point  $Q$ . Let  $R$  be the foot of the perpendicular drawn from  $P$  to the plane  $M$ .

Then which of the following statements is (are) TRUE?

[JEE Advanced 2025 Paper 1]

- (A) The length of the line segment  $PQ$  is  $9\sqrt{3}$   
 (B) The length of the line segment  $QR$  is 15  
 (C) The area of  $\Delta PQR$  is  $\frac{3}{2}\sqrt{234}$   
 (D) The acute angle between the line segments  $PQ$  and  $PR$  is  $\cos^{-1}\left(\frac{1}{2\sqrt{3}}\right)$

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4. Let  $R^3$  denote the three-dimensional space. Take two points  $P = (1,2,3)$  and  $Q = (4,2,7)$ . Let  $\text{dist}(X,Y)$  denote the distance between two points  $X$  and  $Y$  in  $R^3$ . Let  $S = \{X \in R^3 : (\text{dist}(X,P))^2 - (\text{dist}(X,Q))^2 = 50\}$  and  $T = \{Y \in R^3 : (\text{dist}(Y,Q))^2 - (\text{dist}(Y,P))^2 = 50\}$ .

Then which of the following statements is (are) TRUE?

[JEE Advanced 2024 Paper 1]

- (A) There is a triangle whose area is 1 and all of whose vertices are from  $S$ .  
 (B) There are two distinct points  $L$  and  $M$  in  $T$  such that each point on the line segment  $LM$  is also in  $T$ .  
 (C) There are infinitely many rectangles of perimeter 48, two of whose vertices are from  $S$  and the other two vertices are from  $T$ .  
 (D) There is a square of perimeter 48, two of whose vertices are from  $S$  and the other two vertices are from  $T$ .

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5. Let  $\gamma \in \mathbb{R}$  be such that the lines  $L_1: \frac{x+11}{1} = \frac{y+21}{2} = \frac{z+29}{3}$  and  $L_2: \frac{x+16}{3} = \frac{y+11}{2} = \frac{z+4}{\gamma}$  intersect. Let  $R_1$  be the point of intersection of  $L_1$  and  $L_2$ . Let  $O = (0,0,0)$ , and  $\hat{n}$  denote a unit normal vector to the plane containing both the lines  $L_1$  and  $L_2$ .

Match each entry in **List-I** to the correct entry in **List-II**.

[JEE Advanced 2024 Paper 1]

| List-I |                                                   | List-II |                                                                                     |
|--------|---------------------------------------------------|---------|-------------------------------------------------------------------------------------|
| P.     | $\gamma$ equals                                   | 1.      | $-\hat{i} - \hat{j} + \hat{k}$                                                      |
| Q.     | A possible choice for $\hat{n}$ is                | 2.      | $\sqrt{\frac{3}{2}}$                                                                |
| R.     | $\vec{OR}_1$ equals                               | 3.      | 1                                                                                   |
| S.     | A possible value of $\vec{OR}_1 \cdot \hat{n}$ is | 4.      | $\frac{1}{\sqrt{6}}\hat{i} - \frac{2}{\sqrt{6}}\hat{j} + \frac{1}{\sqrt{6}}\hat{k}$ |
|        |                                                   | 5.      | $\sqrt{\frac{2}{3}}$                                                                |

(A) (P)  $\rightarrow$  (3) (Q)  $\rightarrow$  (4) (R)  $\rightarrow$  (1) (S)  $\rightarrow$  (2)

(B) (P)  $\rightarrow$  (5) (Q)  $\rightarrow$  (4) (R)  $\rightarrow$  (1) (S)  $\rightarrow$  (2)

(C) (P)  $\rightarrow$  (3) (Q)  $\rightarrow$  (4) (R)  $\rightarrow$  (1) (S)  $\rightarrow$  (5)

(D) (P)  $\rightarrow$  (3) (Q)  $\rightarrow$  (1) (R)  $\rightarrow$  (4) (S)  $\rightarrow$  (5)

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6. A straight line drawn from the point  $P(1,3,2)$ , parallel to the line  $\frac{x-2}{1} = \frac{y-4}{2} = \frac{z-6}{1}$ , intersects the plane  $L_1: x - y + 3z = 6$  at the point  $Q$ . Another straight line which passes through  $Q$  and is perpendicular to the plane  $L_1$  intersects the plane  $L_2: 2x - y + z = -4$  at the point  $R$ . Then which of the following statements is (are) TRUE?

[JEE Advanced 2024 Paper 2]

(A) The length of the line segment  $PQ$  is  $\sqrt{6}$

(B) The coordinates of  $R$  are  $(1,6,3)$

(C) The centroid of the triangle  $PQR$  is  $\left(\frac{4}{3}, \frac{14}{3}, \frac{5}{3}\right)$

(D) The perimeter of the triangle  $PQR$  is  $\sqrt{2} + \sqrt{6} + \sqrt{11}$

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# JEE ADVANCED THREE DIMENSIONAL GEOMETRY — PYQS

Test Pattern : JEE (Advanced)

## ANSWER KEY

| SECTION-A |      |      |      |            |   |      |  |  |  |  |  |  |  |
|-----------|------|------|------|------------|---|------|--|--|--|--|--|--|--|
| Ques.     | 1    | 2    | 3    | 4          | 5 | 6    |  |  |  |  |  |  |  |
| Ans.      | A, D | A, D | A, C | A, B, C, D | C | A, C |  |  |  |  |  |  |  |