

UNIT TEST

Duration: 1 hour

Marks: 30

SECTION A

Each carry 1 mark

1. What is the distance of point (a, b, c) from x-axis?

- (a) $\sqrt{b^2 + c^2}$ (b) $\sqrt{a^2 + c^2}$ (c) $\sqrt{a^2 + b^2}$ (d) 0

2. What is the angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$?

- (a) 0° (b) 30° (c) 45° (d) 90°

3. The cartesian equation of a line is $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$, then its vector form is

- (a) $\vec{r} = 5\hat{i} + 4\hat{j} + 6\hat{k} + \lambda(3\hat{i} + 7\hat{j} - 2\hat{k})$ (b) $\vec{r} = \hat{i} - 2\hat{j} + 4\hat{k} + \lambda(3\hat{i} - 7\hat{j} - 2\hat{k})$
(c) $\vec{r} = 4\hat{i} - 5\hat{j} + 6\hat{k} + \lambda(3\hat{i} - 7\hat{j} + 2\hat{k})$ (d) $\vec{r} = 5\hat{i} - 4\hat{j} + 6\hat{k} + \lambda(3\hat{i} + 7\hat{j} + 2\hat{k})$

4. Assertion: If a line makes an angle of $\frac{\pi}{4}$ with each of y and z-axes, then it makes a right angle with x-axis.

Reason: The sum of the angles made by a line with the coordinate axes is 180° .

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

SECTION B

Each carry 2 marks

5. Find the angle between the lines $\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda(3\hat{i} + 2\hat{j} + 6\hat{k})$ and $\vec{r} = 7\hat{i} - 6\hat{k} + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$.

6. Find the vector equation of a line passing through the point (1, -1, 2) and parallel to the line whose equation is $\frac{x-3}{1} = \frac{y-1}{2} = \frac{z+1}{-2}$.

7. Show that the line joining the points (1, 2, 3) and (4, 5, 7) is parallel to the line joining the points (-4, 3, -6) and (2, 9, 2).

SECTION C

Each carry 3 marks

8. Find the vector and cartesian equations of the line passing through the point (2, 1, 3) and perpendicular to the lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x}{-3} = \frac{y}{2} = \frac{z}{5}$.

9. Find the points on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of 5 units from the point P(1, 3, 3).

SECTION D

Each carry 5 marks

10. Show that the lines $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(3\hat{i} - \hat{j})$ and $\vec{r} = (4\hat{i} - \hat{k}) + \mu(2\hat{i} + 3\hat{k})$ intersect. Also, find their point of intersection.

11. Find the coordinates of the points where the line of the shortest distance between the lines $\frac{x-12}{-9} = \frac{y-1}{4} = \frac{z-5}{2}$ and $\frac{x-23}{-6} = \frac{y-19}{-4} = \frac{z-25}{3}$ meets them.

SECTION E

12. A football match is organized between students of class XII of two schools, say school A and school B. For which a team from each school is chosen. Remaining students of class XII of school A and B are respectively standing in the lines L_1 and L_2 respectively represented by the equations $\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{r} = 5\hat{i} - 2\hat{j} + 0\hat{k} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$.

Based on the above information, answer the following:

(i) Write the cartesian equations of the lines L_1 and L_2 .

(ii) Write the direction ratios of the lines L_1 and L_2 .

(iii) Find the angle between the lines L_1 and L_2 .

UNIT TEST

1. (a) $\sqrt{b^2 + c^2}$

2. (d) 90°

3. (d) $\vec{r} = 5\hat{i} - 4\hat{j} + 6\hat{k} + \lambda(3\hat{i} + 7\hat{j} + 2\hat{k})$

4. (c) Assertion (A) is true but Reason (R) is false.

5. $\theta = \cos^{-1}\left(\frac{19}{21}\right)$

6. $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \lambda(\hat{i} + 2\hat{j} - 2\hat{k})$

7. Proof

8. $\vec{r} = (2\hat{i} + \hat{j} + 3\hat{k}) + \lambda(2\hat{i} - 7\hat{j} + 4\hat{k})$ and $\frac{x-2}{2} = \frac{y-1}{-7} = \frac{z-3}{4}$

9. (-2, -1, -3) and (4, 3, 7)

10. (4, 0, -1)

11. (3, 5, 7), (11, 11, 31)

12. (i) $\frac{x-3}{1} = \frac{y-2}{2} = \frac{z+4}{2}$ & $\frac{x-5}{3} = \frac{y+2}{2} = \frac{z}{6}$

(ii) 1, 2, 2 & 3, 2, 6

(iii) $\cos^{-1}\left(\frac{19}{21}\right)$