3D

LEVEL−I

1 The locus of the point, which moves such that its distance from (1, −2, 2) is unity, is
(A) $x^2 + y^2 + z^2 - 2x + 4y - 4z + 8 = 0$ (B) $x^2 + y^2 + z^2 - 2x - 4y - 4z + 8 = 0$
(C) $x^2 + y^2 + z^2 + 2x + 4y - 4z + 8 = 0$ (D) $x^2 + y^2 + z^2 - 2x + 4y + 4z + 8 = 0$

*2 The angle between the lines whose direction ratios are 1, 1, 2; $\sqrt{3} - 1, -\sqrt{3} - 1, 4$ is
(A) $\cos^{-1}\left(\frac{1}{65}\right)$ (B) $\frac{\pi}{6}$
(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

*3. The plane passing through the point (a, b, c) and parallel to the plane x + y + z = 0 is
(A) x + y + z = a + b + c (B) x + y + z + (a + b + c) = 0
(C) x + y + z + abc = 0 (D) ax + by + cz = 0

4. The equation of line through the point (1, 2, 3) parallel to line $\frac{x-4}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ are
(A) $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z-3}{8}$ (B) $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$
(C) $\frac{x-4}{1} = \frac{y+1}{2} = \frac{z+10}{3}$ (D) none of these

5. The value of k, so that the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$, $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ are perpendicular to each other, is
(A) $-\frac{10}{7}$ (B) $-\frac{8}{7}$
(C) $-\frac{6}{7}$ (D) 1

*6. The angle between a line with direction ratios 2:2:1 and a line joining (3,1,4,) to (7,2,12)
(A) $\cos^{-1}\left(\frac{2}{3}\right)$ (B) $\cos^{-1}\left(\frac{3}{2}\right)$
(C) $\tan^{-1}\left(\frac{2}{3}\right)$ (D) none of these

7. The equation of a plane which passes through (2, –3, 1) and is normal to the line joining the points (3, 4, –1) and (2, – 1, 5) is given by
(A) x + 5y – 6z + 19 = 0 (B) x – 5y + 6z –19 = 0
(C) x + 5y + 6z +19 = 0 (D) x – 5y – 6z – 19 = 0

8. Direction cosines of the line joining the points (0, 0, 0) and (a, a, a) are
(A) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$ (B) 1, 1, 1
(C) $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ (D) none of these

*9. The length of perpendicular from the point (–1, 2, –2)) on the line $\frac{x+1}{2}=\frac{y-2}{-3}=\frac{z+2}{4}$ is

(A) $\sqrt{29}$ (B) $\sqrt{6}$
(C) $\sqrt{21}$ (D) none of these

10. Two lines not lying in the same plane are called
(A) parallel (B) coincident
(C) intersecting (D) skew

11. The distance of the point (x, y, z) from the x – y plane is
(A) x (B) | y |
(C) 3 (D) | z |

12. A point (x, y, z) moves parallel to x – axis. Which of three variables x, y, z remains fixed?
(A) x and y (B) y and z
(C) z and x (D) None of these

*13. Let P ≡ (–2, 3, 5), Q ≡ (1, 2, 3), R ≡ (7, 0, –1) then Q divides PR.
(A) externally in the ratio 1 : 2 (B) internally in the ratio 1 : 2
(C) externally in the ratio 3 : 5 (D) internally in the ratio 1: 3

14. The xy plane divides the line segment joining (1, 2, 3) and (–3, 4, –5) internally in the ratio
(A) 3 : 5 (B) 3 : 4
(C) 4 : 3 (D) None of these

15. The direction cosines of the joining (1, –1, 1) and (–1, 1, 1) are
(A) $<\frac{1}{\sqrt{2}},\frac{-1}{\sqrt{2}},0>$ (B) $<\sqrt{2},-\sqrt{2},0>$
(C) $<\frac{1}{2},\frac{-1}{2},0>$ (D) $<2,-2,0>$

16. Two lines with direction cosines $<l_1,m_1,n_1>$ and $<l_2,m_2,n_2>$ are at right angles iff
(A) $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$ (B) $l_1 = l_2$, $m_1 = m_2$, $n_1 = n_2$
(C) $l_1 l_2 = m_1 m_2 = n_1 n_2$ (D) None of these

17. The foot of perpendicular from (α,β,γ) on x – axis is
(A) $(\alpha, 0, 0)$ (B) $(0, \beta, 0)$
(C) $(0, 0, \gamma)$ (D) (0, 0, 0)

18. The direction cosines of a line equally inclined to the positive direction of axes are
(A) < 1, 1, 1> (B) $\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$
(C) $\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ (D) None of these

19. A plane meets the co–ordinate axes at P, Q and R such that the centroid of the triangle is (1, 1, 1). The equation of plane is,
(A) x + y + z = 3 (B) x + y + z = 9
(C) x + y + z = 1 (D) x + y + z = 1/3

*20. A plane meets the axes in P, Q and R such that centroid of the triangle PQR is (1, 2, 3). The equation of the plane is

(A) $6x + 3y + 2z = 6$ (B) $6x + 3y + 2z = 12$
(C) $6x + 3y + 2z = 1$ (D) $6x + 3y + 2z = 18$

21. The direction cosines of a normal to the plane $2x - 3y - 6z + 14 = 0$ are
(A) $\left(\frac{2}{7}, \frac{-3}{7}, \frac{-6}{7}\right)$ (B) $\left(\frac{-2}{7}, \frac{3}{7}, \frac{6}{7}\right)$
(C) $\left(\frac{-2}{7}, \frac{-3}{7}, \frac{-6}{7}\right)$ (D) None of these

*22. The equation of the plane whose intercept on the axes are thrice as long as those made by the plane $2x - 3y + 6z - 11 = 0$ is
(A) $6x - 9y + 18z - 11 = 0$ (B) $2x - 3y + 6z + 33 = 0$
(C) $2x - 3y + 6z = 33$ (D) None of these

23. The angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$ is
(A) $\pi/4$ (B) $\pi/6$
(C) $\pi/3$ (D) $\pi/2$

*24. The angle between the lines $x = 1$, $y = 2$ and $y + 1 = 0$ and $z = 0$ is
(A) 0^0 (B) $\pi/4$
(C) $\pi/3$ (D) $\pi/2$

LEVEL−II

1. The three lines drawn from O with direction ratios [1, −1, k], [2, −3, 0] and [1, 0, 3] are coplanar. Then k =
(A) 1 (B) 0
(C) no such k exists (D) none of these

2. A plane meets the coordinates axes at A, B, C such that the centroid of the triangle is (3, 3, 3). The equation of the plane is
(A) $x + y + z = 3$ (B) $x + y + z = 9$
(C) $3x + 3y + 3z = 1$ (D) $9x + 9y + 9z = 1$

3. The equation of the plane through the intersection of the planes $x - 2y + 3z - 4 = 0$, $2x - 3y + 4z - 5 = 0$ and perpendicular to the plane $x + y + z - 1 = 0$ is
(A) $x - y + 2 = 0$ (B) $x - z + 2 = 0$
(C) $y - z + 2 = 0$ (D) $z - x + 2 = 0$

4. The coordinates of the point of intersection of the line $\frac{x+1}{1} = \frac{y+3}{3} = \frac{z+2}{-2}$ with the plane $3x + 4y + 5z = 5$ are
(A) (5, 15, −14) (B) (3, 4, 5)
(C) (1, 3, −2) (D) (3, 12, −10)

5. The angle between the line $\frac{x+1}{3} = \frac{y-1}{2} = \frac{z-2}{4}$ and the plane $2x + y - 3z + 4 = 0$ is
(A) $\cos^{-1}\left(\frac{-4}{\sqrt{406}}\right)$ (B) $\sin^{-1}\left(\frac{-4}{\sqrt{406}}\right)$
(C) $30°$ (D) none of these

*6. The angle between the lines whose direction cosines satisfy the equations $l + m + n = 0$, $l^2 + m^2 - n^2 = 0$ is given by

(A) $\frac{2\pi}{3}$ (B) $\frac{\pi}{6}$

(C) $\frac{5\pi}{6}$ (D) $\frac{\pi}{3}$

*7. The angle between the line $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z-3}{2}$ and the plane $3x + 6y - 2z + 5 = 0$ is

(A) $\cos^{-1}\left(\frac{4}{21}\right)$ (B) $\sin^{-1}\left(-\frac{4}{21}\right)$

(C) $\sin^{-1}\left(\frac{6}{21}\right)$ (D) $\sin^{-1}\left(\frac{4}{21}\right)$

*8. Shortest distance between lines $\frac{x-6}{1} = \frac{y-2}{-2} = \frac{z-2}{2}$ and $\frac{x+4}{3} = \frac{y}{-2} = \frac{z+1}{-2}$ is

(A) 108 (B) 9

(C) 27 (D) None of these

9. The acute angle between the plane $5x - 4y + 7z - 13 = 0$ and the y–axis is given by

(A) $\sin^{-1}\left(\frac{5}{\sqrt{90}}\right)$ (B) $\sin^{-1}\left(-\frac{4}{\sqrt{90}}\right)$

(C) $\sin^{-1}\left(\frac{7}{\sqrt{90}}\right)$ (D) $\sin^{-1}\left(\frac{4}{\sqrt{90}}\right)$

10. The planes $x + y - z = 0$, $y + z - x = 0$, $z + x - y = 0$ meet

(A) in a line

(B) taken two at a time in parallel lines

(C) in a unique point (D) none of these

11. The graph of the equation $x^2 + y^2 = 0$ in the three dimensional space is

(A) z – axis (B) (0, 0) point

(C) y – z plane (D) x – y plane

12. A line making angles 45^0 and 60^0 with the positive directions of the x – axis and y – axis respectively, makes with the positive direction of z – axis an angle of

(A) 60^0 (B) 120^0

(C) both (A) and (B) (D) Neither (A) nor (B)

13. The angle between two diagonals of a cube is

(A) $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$ (B) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

(C) $\cos^{-1}\left(\frac{1}{3}\right)$ (D) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

14. If a line makes angles α, β, γ with the axes, then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$

(A) – 1 (B) 1

(C) 2 (D) – 2

15. The equation (x – 1) . (x – 2) = 0 in three dimensional space is represented by
(A) a pair of straight line
(B) a pair of parallel planes
(C) a pair of intersecting planes
(D) a sphere

*16. The equation of the plane containing the line 2x + z – 4 = 0 and 2y + z = 0 and passing through the point (2, 1, –1) is
(A) x + y – z = 4
(B) x – y – z = 2
(C) x + y + z + 2 = 0
(D) x + y + z = 2

*17. The locus of xy + yz = 0 is, in 3 – D ;
(A) a pair of straight lines
(B) a pair of parallel lines
(C) a pair of parallel planes
(D) a pair of intersecting planes

18. The lines 6x = 3y = 2z and $\frac{x-1}{-2}=\frac{y-2}{-4}=\frac{z-3}{-6}$ are
(A) parallel
(B) skew
(D) intersecting
(D) coincident

*19. The line $\frac{x-x_1}{0}=\frac{y-y_1}{1}=\frac{z-z_1}{2}$ is
(A) parallel to x – axis
(B) perpendicular to x – axis
(C) perpendicular to YOZ plane
(D) None of these

20. For the line $l:\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-3}{-1}$ and plane P : x – 2y – z = 0 ; of the following assertions, the one/s which is/are true :–
(A) l lies on P
(B) l is parallel to P
(C) l is perpendicular to P
(D) None of these

21. The co–ordinates of the point of intersection of the line $\frac{x-6}{-1}=\frac{y+1}{0}=\frac{z+3}{4}$ and the plane $x+y-z=3$ are
(A) (2, 1, 0)
(B) (7, –1, –7)
(C) (1, 2, –6)
(D) (5, –1, 1)

*22. The Cartesian equation of the plane perpendicular to the line, $\frac{x-1}{2}=\frac{y-3}{-1}=\frac{z-4}{2}$ and passing through the origin is
(A) 2x – y + 2z – 7 = 0
(B) 2x + y + 2z = 0
(C) 2x – y + 2z = 0
(D) 2x – y – z = 0

Level – III

*1. The length of projection of the segment joining (x_1, y_1, z_1) and (x_2, y_2, z_2) on the line $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ is

(A) $\left|l(x_2 - x_1) + m(y_2 - y_1) + n(z_2 - z_1)\right|$ (B) $\left|\alpha(x_2 - x_1) + \beta(y_2 - y_1) + \gamma(z_2 - z_1)\right|$

(C) $\left|\frac{x_2 - x_1}{l} + \frac{y_2 - y_1}{m} + \frac{z_2 - z_1}{n}\right|$ (D) None of these

2. The shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-5}{5}$ is

(A) $\frac{1}{6}$ (B) $\frac{1}{\sqrt{6}}$

(C) $\frac{1}{\sqrt{3}}$ (D) $\frac{1}{3}$

3. The equation of the plane through the point (–1, 2, 0) and parallel to the lines $\frac{x}{3} = \frac{y+1}{0} = \frac{z-2}{-1}$ and $\frac{x-1}{1} = \frac{2y+1}{2} = \frac{z+1}{-1}$ is

(A) $2x + 3y + 6z - 4 = 0$ (B) $x - 2y + 3z + 5 = 0$

(C) $x + y - 3z + 1 = 0$ (D) $x + y + 3z = 1$

*4. The distance of the plane through (1, 1, 1) and perpendicular to the line $\frac{x-1}{3} = \frac{y-1}{0} = \frac{z-1}{4}$ from the origin is

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$

(C) $\frac{7}{5}$ (D) 1

*5. The reflection of the point (2, –1, 3) in the plane $3x - 2y - z = 9$ is

(A) $\left(\frac{26}{7}, \frac{15}{7}, \frac{17}{7}\right)$ (B) $\left(\frac{26}{7}, \frac{-15}{7}, \frac{17}{7}\right)$

(C) $\left(\frac{15}{7}, \frac{26}{7}, \frac{-17}{7}\right)$ (D) $\left(\frac{26}{7}, \frac{17}{7}, \frac{-15}{7}\right)$

6. The co–ordinates of the foot of perpendicular from the point A (1, 1, 1) on the line joining the points B (1, 4, 6) and C (5, 4, 4) are

(A) (3, 4, 5) (B) (4, 5, 3)

(C) (3, –4, 5) (D) (–3, –4, 5)

7. The equation of the right bisecting plane of the segment joining the points (a, a, a) and (–a, –a, –a) ; $a \neq 0$ is

(A) $x + y + z = a$ (B) $x + y + z = 3a$

(C) $x + y + z = 0$ (D) $x + y + z + a = 0$

8. The angle between the plane $3x + 4y = 0$ and the line $x^2 + y^2 = 0$ is

(A) 0^0 (B) 30^0

(C) 60^0 (D) 90^0

9. If the points (0, –1, –2) ; (–3, –4, –5) ; (–6, –7, –8) and (x, x, x) are non–coplanar then x =
(A) any real number
(B) –1
(C) 1
(D) 0

*10. The equation of the plane through intersection of planes $x + 2y + 3z = 4$ and $2x + y - z = -5$ and perpendicular to the plane $5x + 3y + 6z + 8 = 0$ is
(A) $7x - 2y + 3z + 81$
(B) $23y + 14x - 9z + 48 = 0$
(C) $23x + 14y - 9z + 48 = 0$
(D) $51x + 15y - 50z + 173 = 0$

11. The equation of the plane passing through the intersection of planes $x + 2y + 3z + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the origin is
(A) $3x + 2y + z + 1 = 0$
(B) $3x + 2y + z = 0$
(C) $2x + 3y + z = 0$
(D) $x + y + z = 0$

12. If the plane $x + y - z = 4$ is rotated through 90^0 about the line of intersection with the plane $x + y + 2z = 4$ then equation of the plane in its new position is
(A) $5x + y + 4z + 20 = 0$
(B) $5x + y + 4z = 20$
(C) $x + 5y + 4z = 20$
(D) None of these

13. The equation of the plane passing through the line of intersection of the planes $4x - 5y - 4z = 1$ and $2x + y + 2z = 8$ and the point (2, 1, 3) is
(A) $32x - 5y + 8z = 83$
(B) $32x + 5y - 8z = 83$
(C) $32x - 5y + 8z + 83 = 0$
(D) None of these

14. The equation of the plane passing through the points (2, 1, 2) and (1, 3, –2) and parallel to x– axis is
(A) $x + 2y = 4$
(B) $2y + x + z = 4$
(C) $x + y + z = 4$
(D) $2y + z = 4$

15. The equation of the plane passing through the point (–3, –3, 1) and is normal to the line joining the points (2, 6, 1) and (1, 3, 0) is
(A) $x + 3y + z + 11 = 0$
(B) $x + y + 3z + 11 = 0$
(C) $3x + y + z = 11$
(D) None of these

*16. If a point moves so that the sum of the squares of its distances from the six faces of a cube having length of each edge 2 units is 46 units, then the distance of the point from (1,1, 1) is
(A) a variable .
(B) a constant equal to 7 units.
(C) a constant equal to 4 units.
(D) a constant equal to 49 units.

17. Planes are drawn parallel to the co–ordinate planes through the points (1, 2, 3) and (3, –4, –5). The length of the edges of the parallelepiped so found, are
(A) 4, 6, 8
(B) 3, 4, 5
(C) 2, 4, 5
(D) 2, 6, 8

18. The length of a line segment whose projections on the co–ordinate axes are 6, –3, 2, is
(A) 7
(B) 6
(C) 5
(D) 4

19. The direction cosines of a line segment whose projections on the co–ordinate axes are 6, –3, 2, are

(A) $\left(\frac{6}{7}, \frac{-3}{7}, \frac{2}{7}\right)$ (B) $\left(\frac{-6}{7}, \frac{3}{7}, \frac{2}{7}\right)$

(C) $\left(\frac{6}{7}, \frac{-3}{7}, \frac{-2}{7}\right)$ (D) None of these

20. If P, Q, R, S are (3, 6, 4), (2, 5, 2), (6, 4, 4) , (0, 2, 1) respectively then the projection of PQ on RS is

(A) 2 units (B) 4 uints

(C) 6 uints (D) 8 uints

21. Let f be a one–one function with domain (–2, 1, 0) and range (1, 2, 3) such that exactly one of the following statements is true. f (–2) = 1, f (1) $\neq$ 1, f (0) $\neq$ 2 and the remaining two are false. The distance between points (–2, 1, 0) and (f (–2), f (1), f (0)) is

(A) 2 (B) 3

(C) 4 (D) 5

ANSWERS

LEVEL –I

1.	A	2.	C	3	A	4.	A
5.	A	6.	A	7.	A	8.	C
9.	D						

10. (D)
11. (D)
12. (B)
13. (B)
14. (A)
15. A
16. (A)
17. (A)
18. (B)
19. (A)
20. (D)
21. (A)
22. (C)
23. (C)
24. (D)

LEVEL –II

1.	A	2.	B	3.	B	4.	A
5.	B	6.	D	7.	B	8.	B
9.	D	10.	C				

11. (D)
12. (C)
13. (B)
14. (A)
15. (B)
16. (D)
17. (D)
18. (D)
19. (B)
20.
21. (D)
22. (C)

Level – III

1. (A)
2. (B)
3. (D)
4. (C)
5. (B)
6. A
7. (C)
8. (A)
9. (A)
10. (D)
11. (B)
12. (B)

13. (A)
14. (D)
15. (A)
16. (B)
17. (D)
18. (A)
19. (A)
20. (A)
21. (D)