EXERCISE – I

SINGLE CORRECT (OBJECTIVE QUESTIONS)

1. If the sum of the squares of the distances of a point from the three coordinate axes be 36, then its distance from the origin is

(A) 6 (B) $3\sqrt{2}$ (C) $2\sqrt{3}$ (D) $6\sqrt{2}$

2. The locus of a point P which moves such that $PA^2 - PB^2 = 2k^2$ where A and B are (3, 4, 5) and (–1, 3, –7) respectively is

(A) $8x + 2y + 24z - 9 + 2k^2 = 0$
(B) $8x + 2y + 24z - 2k^2 = 0$
(C) $8x + 2y + 24z + 9 + 2k^2 = 0$ (D) None of these

3. A line makes angles α, β, γ with the coordinates axes. If $\alpha + \beta = 90°$, then γ equal to

(A) 0 (B) 90° (C) 180° (D) None of these

4. The coordinates of the point A, B, C, D are $(4, \alpha, 2)$, $(5, -3, 2)$, $(\beta, 1, 1)$ & $(3, 3, -1)$. Line AB would be perpendicular to line CD when

(A) $\alpha = -1, \beta = -1$ (B) $\alpha = 1, \beta = 2$
(C) $\alpha = 2, \beta = 1$ (D) $\alpha = 2, \beta = 2$

5. The locus represented by $xy + yz = 0$ is

(A) A pair of perpendicular lines
(B) A pair of parallel lines
(C) A pair of parallel planes
(D) A pair of perpendicular planes

6. The equation of plane which passes through (2, –3, 1) & is normal to the line joining the points (3, 4, –1) & (2, – 1, 5) is given by

(A) $x + 5y - 6z + 19 = 0$ (B) $x - 5y + 6z - 19 = 0$
(C) $x + 5y + 3z + 19 = 0$ (D) $x - 5y - 6z - 19 = 0$

7. The equation of the plane passing through the point (1, – 3, –2) and perpendicular to planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$, is

(A) $2x - 4y + 3z - 8 = 0$ (B) $2x - 4y - 3z + 8 = 0$
(C) $2x - 4y + 3z + 8 = 0$ (D) None of these

8. A variable plane passes through a fixed point (1, 2, 3). The locus of the foot of the perpendicular drawn from origin to this plane is

(A) $x^2 + y^2 + z^2 - x - 2y - 3z = 0$
(B) $x^2 + 2y^2 + 3z^2 - x - 2y - 3z = 0$
(C) $x^2 + 4y^2 + 9z^2 + x + 2y + 3 = 0$
(D) $x^2 + y^2 + z^2 + x + 2y + 3z = 0$

9. 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) $\left(\frac{26}{7}, \frac{15}{7}, \frac{-15}{7}\right)$

10. The distance of the point (–1, –5, –10) from the point of intersection of the line, $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane, $x - y + z = 5$, is

(A) 10 (B) 11 (C) 12 (D) 13

11. The distance of the point (1, –2, 3) from the plane $x - y + z = 5$ measured parallel to the line, $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is

(A) 1 (B) 6/7 (C) 7/6 (D) None of these

12. The straight lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x-1}{2} = \frac{y-2}{2} = \frac{z-3}{-2}$ are

(A) Parallel lines (B) intersecting at 60°
(C) Skew lines (D) Intersecting at right angle

13. If plane cuts off intercepts OA = a, OB = b, OC = c from the coordinate axes, then the area of the triangle ABC equal to

(A) $\frac{1}{2}\sqrt{b^2c^2 + c^2a^2 + a^2b^2}$ (B) $\frac{1}{2}(bc + ca + ab)$

(C) $\frac{1}{2}abc$ (D) $\frac{1}{2}\sqrt{(b+c)^2(c-a)^2 + (a-b)^2}$

14. A point moves so that the sum of the squares of its distances from the six faces of a cube given by $x = \pm 1, y = \pm 1, z = \pm 1$ is 10 units. The locus of the point is

(A) $x^2 + y^2 + z^2 = 1$ (B) $x^2 + y^2 + z^2 = 2$
(C) $x + y + z = 1$ (D) $x + y + z = 2$

15. A variable plane passes through a fixed point (a, b, c) and meets the coordinate axes in A, B, C. Locus of the point common to the planes through A, B, C and parallel to coordinate plane, is

(A) $\frac{a}{x}+\frac{b}{y}+\frac{c}{z} = 1$ (B) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c} = 1$

(C) $ax + by + cz = 1$ (D) None of these

16. Two systems of rectangular axes have same origin. If a plane cuts them at distances a, b, c and a_1, b_1, c_1 from the origin, then

(A) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a_1^2}+\frac{1}{b_1^2}+\frac{1}{c_1^2}$

(B) $\frac{1}{a^2}-\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a_1^2}-\frac{1}{b_1^2}+\frac{1}{c_1^2}$

(C) $a^2 + b^2 + c^2 = a_1^2+b_1^2+c_1^2$

(D) $a^2 - b^2 + c^2 = a_1^2+b_1^2+c_1^2$

17. Equation of plane which passes through the point of intersection of lines $\frac{x-1}{3}=\frac{y-2}{1}=\frac{z-3}{2}$ and $\frac{x-3}{1}=\frac{y-1}{2}=\frac{z-2}{3}$ and at greatest distance from the point (0, 0, 0) is

(A) $4x + 3y + 5z = 25$ (B) $4x + 3y + 5z = 50$

(C) $3x + 4y + 5z = 49$ (D) $x + 7y - 5z = 2$

18. The angle between the plane $2x - y + z = 6$ and a plane perpendicular to the planes $x + y + 2z = 7$ and $x - y = 3$ is

(A) $\pi/4$ (B) $\pi/3$ (C) $\pi/6$ (D) $\pi/2$

19. The non zero value of 'a' for which the lines $2x - y + 3z + 4 = 0 = ax + y - z + 2$ and $x - 3y + z = 0 = x + 2y + z + 1$ are co-planar is

(A) –2 (B) 4 (C) 6 (D) 0

20. If the lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}, \frac{x-1}{3}=\frac{y-2}{-1}=\frac{z-3}{4}$ and $\frac{x+k}{3}=\frac{y-1}{2}=\frac{z-2}{h}$ are concurrent then

(A) $h = -2, k = -6$ (B) $h = \frac{1}{2}, k = 2$

(C) $h = 6, k = 2$ (D) $h = 2, k = \frac{1}{2}$

21. The coplanar points A, B, C, D are $(2 - x, 2, 2)$, $(2, 2 - y, 2)$, $(2, 2, 2 - z)$ and $(1, 1, 1)$ respectively. Then

(A) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 1$ (B) $x + y + z = 1$

(C) $\frac{1}{1-x}+\frac{1}{1-y}+\frac{1}{1-z} = 1$ (D) None of these

22. The direction ratios of a normal to the plane through (1, 0, 0), (0, 1, 0), which makes an angle of $\pi/4$ with the plane $x + y = 3$ are

(A) $(1, \sqrt{2}, 1)$ (B) $(1, 1, \sqrt{2})$

(C) (1, 1, 2) (D) $(\sqrt{2}, 1, 1)$

23. Let the points A(a, b, c) and B(a′, b′, c′) be at distances r and r′ from origin. The line AB passes through origin when

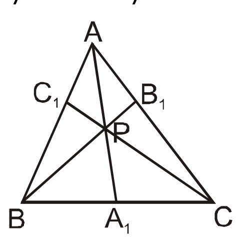
(A) $\frac{a'}{a}=\frac{b'}{b}=\frac{c'}{c}$ (B) $aa' + bb' + cc' = rr'$

(C) $aa' + bb' + cc' = r^2 + r'^2$ (D) None of these

24. The base of the pyramid AOBC is an equilateral triangle OBA with each side equal to $4\sqrt{2}$, 'O' is the origin of reference, AC is perpendicular to the plane of Δ OBC and $|\overrightarrow{AC}| = 2$. Then the cosine of the angle between the skew straight lines one passing through A and the mid point of OB and the other passing through O and the mid point of BC is

(A) $-\frac{1}{\sqrt{2}}$ (B) 0 (C) $\frac{1}{\sqrt{6}}$ (D) $\frac{1}{\sqrt{2}}$

25. In the adjacent figure 'P' is any arbitrary interior point of the triangle ABC such that the lines AA_1, BB_1, CC_1 are concurrent at P.



Value of $\frac{PA_1}{AA_1}+\frac{PB_1}{BB_1}+\frac{PC_1}{CC_1}$ is always equal to

(A) 1 (B) 2 (C) 3 (D) None of these

26. Let L be the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$. If L makes an angle α with the positive x-axis, the $\cos\alpha$ equals

(A) $\frac{1}{\sqrt{3}}$ (B) $\frac{1}{2}$ (C) 1 (D) $\frac{1}{\sqrt{2}}$

27. If a line makes an angle of $\frac{\pi}{4}$ with the positive directions of each of x-axis and y-axis, then the angle that the line makes with the positive direction of the z-axis is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

28. If the angle θ between the line $\frac{x+1}{1}=\frac{y-1}{2}=\frac{z-2}{2}$ and the plane $2x - y + \sqrt{\lambda}\,z + 4 = 0$ is such that $\sin\theta = \frac{1}{3}$. The value of λ is

(A) $-\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $-\frac{3}{5}$ (D) $\frac{5}{3}$

29. A line makes the same angle θ with each of the x and z-axis. If the angle β, which it makes with y-axis is such that $\sin^2\beta = 3\sin^2\theta$, then $\cos^2\theta$ equals

(A) 2/3 (B) 1/5 (C) 3/5 (D) 2/5

30. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is

(A) 3/2 (B) 5/2 (C) 7/2 (D) 9/2

31. A line with direction cosines proportional to 2, 1, 2 meets each of the lines $x = y + a = z$ and $x + a = 2y = 2z$. The co-ordinates of each of the points of intersection are given by

(A) (3a, 3a, 3a), (a, a, a) (B) (3a, 2a, 3a), (a, a, a)
(C) (3a, 2a, 3a), (a, a, 2a) (D) (2a, 3a, 3a,), (2a, a, a)

32. A tetrahedron has vertices at O(0, 0, 0), A(1, 2, 1), B(2, 1, 3) and C(–1, 1, 2). Then the angle between the face OAB and ABC will be

(A) $\cos^{-1}\left(\frac{19}{35}\right)$ (B) $\cos^{-1}\left(\frac{17}{31}\right)$
(C) 30° (D) 90°

33. The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if

(A) k = 0 or –1 (B) k = 1 or –1
(C) k = 0 or –3 (D) k = 3 or –3

34. The two lines $x = ay + b$, $z = cy + d$ and $x = a'y + b'$, $z = c'y + d'$ will be perpendicular, iff

(A) $aa' + bb' + cc' + 1 = 0$
(B) $aa' + bb' + cc' = 0$
(C) $(a + a')(b + b') + (c + c') = 0$
(D) $aa' + cc' + 1 = 0$

35. The equation of plane which meet the co-ordinate axes whose centroid is (a, b, c)

(A) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c} = 1$ (B) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c} = 0$
(C) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c} = 3$ (D) $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=\frac{1}{3}$

36. Let O be the origin and P be the point at a distance 3 units from origin. If D.r.'s of OP are (1, –2, –2), then co-ordinates of P is given by

(A) 1, –2, –2 (B) 3, –6, –6
(C) 1/3, –2/3, –2/3 (D) 1/9, –2/9, –2/9

37. Angle between the pair of lines

$\frac{x-2}{1}=\frac{y-1}{5}=\frac{z+3}{-3}$ and $\frac{x+1}{-1}=\frac{y-4}{8}=\frac{z-5}{4}$

(A) $\cos^{-1}\left(\frac{13}{9\sqrt{38}}\right)$ (B) $\cos^{-1}\left(\frac{26}{9\sqrt{38}}\right)$
(C) $\cos^{-1}\left(\frac{4}{\sqrt{38}}\right)$ (D) $\cos^{-1}\left(\frac{2\sqrt{2}}{\sqrt{19}}\right)$

38. A variable plane is at a constant distance p from the origin and meets the axes in A, B and C. The locus of the centroid of the tetrahedron OABC is

(A) $x^{-2} + y^{-2} + z^{-2} = 16p^{-2}$
(B) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{16}{p}$
(C) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2} = 16$ (D) None of these

39. ABC is a triangle where A = (2, 3, 5), B = (–1, 2, 2) and C(λ, 5, μ). If the median through A is equally inclined to the axes then

(A) $\lambda = \mu = 5$ (B) $\lambda = 5, \mu = 7$
(C) $\lambda = 6, \mu = 9$ (D) $\lambda = 0, \mu = 0$

40. A mirror and a source of light are situated at the origin O and at a point on OX, respectively. A ray of light from the source strikes the mirror and is reflected. If the D.r.'s of the normal to the plane are 1, −1, 1, then D.C.'s of 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) $-\frac{1}{3},-\frac{2}{3},\frac{2}{3}$

41. The shortest distance between the z-axis and the line, $x + y + 2z - 3 = 0$, $2x + 3y + 4z - 4 = 0$ is

(A) 1 (B) 2 (C) 3 (D) None of these

42. The line, $\frac{x-2}{3}=\frac{y+1}{2}=\frac{z-1}{-1}$ intersects the curve $xy = c^2$, $z = 0$ then c is equal to

(A) ± 1 (B) $\pm\frac{1}{3}$ (C) $\pm\sqrt{5}$ (D) None of these

43. The equation of motion of a point in space is $x = 2t$, $y = -4t$, $z = 4t$ where t measured in hours and the co-ordinates of moving point in kilometers. The distance of the point from the starting point O(0, 0, 0) in 10 hours is

(A) 20 km (B) 40 km (C) 60 km (D) 55 km

44. Minimum value of $x^2 + y^2 + z^2$ when $ax+by+cz=p$ is

(A) $\frac{p}{\Sigma a}$ (B) $\frac{p^2}{\Sigma a^2}$ (C) $\frac{\Sigma a^2}{p}$ (D) 0

45. The direction cosines of a line equally inclined to three mutually perpendicular lines having D.C.'s as ℓ_1, m_1, n_1 ; ℓ_2, m_2, n_2 ; ℓ_3, m_3, n_3 are

(A) $\ell_1+\ell_2+\ell_3$, $m_1 + m_2 + m_3$, $n_1 + n_2 + n_3$

(B) $\frac{\ell_1+\ell_2+\ell_3}{\sqrt{3}},\frac{m_1+m_2+m_3}{\sqrt{3}},\frac{n_1+n_2+n_3}{\sqrt{3}}$

(C) $\frac{\ell_1+\ell_2+\ell_3}{3},\frac{m_1+m_2+m_3}{3},\frac{n_1+n_2+n_3}{3}$

(D) None of these

46. The co-ordinates of the point where the line joining the points (2, −3, 1), (3, −4, −5) cuts the plane $2x + y + z = 7$ are

(A) (2,1,0) (B) (3,2,5) (C) (1,–2,7) (D) None of these

47. If the line joining the origin and the point (−2, 1, 2) makes angle θ_1, θ_2 and θ_3 with the positive direction of the coordinate axes, then the value of $\cos 2\theta_1 + \cos 2\theta_2 + \cos 2\theta_3$ is

(A) −1 (B) 1 (C) 2 (D) −2

48. The square of the perpendicular distance of point P(p, q, r) from a line through A(a, b, c) and whose direction cosine are ℓ, m, n is

(A) $\Sigma\{(q-b)n-(r-c)m\}^2$ (B) $\Sigma\{(q+b)n-(r+c)m\}^2$

(C) $\Sigma\{(q-b)n+(r-c)m\}^2$ (D) None of these