Assignment

System of Co-ordinates

Basic Level

1. From which of the following the distance of the point (1,2,3) is $\sqrt{10}$

   (a) Origin (b) *x*-axis (c) *y*-axis (d) *z*-axis

2. If $A(1,2,3); B(-1,-1,-1)$ be the points, then the distance *AB* is **[MP PET 2001]**

   (a) $\sqrt{5}$ (b) $\sqrt{21}$ (c) $\sqrt{29}$ (d) None of these

3. Perpendicular distance of the point (3,4,5) from the *y*-axis, is **[MP PET 1994]**

   (a) $\sqrt{34}$ (b) $\sqrt{41}$ (c) 4 (d) 5

4. Distance between the points (1,3,2) and (2,1,3) is **[MP PET 1988]**

   (a) 12 (b) $\sqrt{12}$ (c) $\sqrt{6}$ (d) 6

5. The shortest distance of the point (*a*,*b*,*c*) from the *x*-axis is **[MP PET 1999; DCE 1999]**

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

6. Points (1,1,1), $(-2,4,1),(-1,5,5)$ and (2,2,5) are the vertices of

   (a) Rectangle (b) Square (c) Parallelogram (d) Trapezium

7. The triangle formed by the points (0,7,10), (–1,6,6) (–4,9,6) is **[Rajasthan PET 2001]**

   (a) Equilateral (b) Isosceles (c) Right angled (d) Right angled isosceles

8. The points $A(5,-1,1)$; $B(7,-4,7)$; $C(1,-6,10)$ and $D(-1,-3,4)$ are vertices of a **[Rajasthan PET 2000]**

   (a) Square (b) Rhombus (c) Rectangle (d) None of these

9. The coordinates of a point which is equidistant from the points (0,0,0), (*a*,0,0), (0,*b*,0) and (0,0,*c*) are given by **[MP PET 1993; Rajasthan PET 2003]**

   (a) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$ (b) $\left(-\frac{a}{2},-\frac{b}{2},\frac{c}{2}\right)$ (c) $\left(\frac{a}{2},-\frac{b}{2},-\frac{c}{2}\right)$ (d) $\left(-\frac{a}{2},\frac{b}{2},-\frac{c}{2}\right)$

10. If $A(1,2,-1)$ and $B(-1,0,1)$ are given, then the coordinates of *P* which divides *AB* externally in the ratio $1:2$, are[MP PET

    (a) $\frac{1}{3}(1,4,-1)$ (b) $(3,4,-3)$ (c) $\frac{1}{3}(3,4,-3)$ (d) None of these

11. The coordinates of the point which divides the join of the points $(2,-1,3)$ and (4,3,1) in the ratio $3:4$ internally are given by **[MP PET 1997]**

    (a) $\frac{2}{7},\frac{20}{7},\frac{10}{7}$ (b) $\frac{15}{7},\frac{20}{7},\frac{3}{7}$ (c) $\frac{10}{7},\frac{15}{7},\frac{2}{7}$ (d) $\frac{20}{7},\frac{5}{7},\frac{15}{7}$

12. Points (–2, 4, 7), (3, –6, –8) and (1, –2, –2) are **[AI CBSE 1982]**

(a) Collinear (b) Vertices of an equilateral triangle

(c) Vertices of an isosceles triangle (d) None of these

13. Which of the following set of points are non-collinear **[MP PET 1990]**

(a) (1, −1, 1), (−1, 1, 1), (0, 0, 1) (b) (1, 2, 3), (3, 2, 1), (2, 2, 2)

(c) (−2, 4, −3), (4, −3, −2), (−3, −2, 4) (d) (2, 0, −1), (3, 2, −2), (5, 6, −4)

14. If the points (−1, 3, 2), (−4, 2, −2) and (5, 5, λ) are collinear, then $\lambda =$

(a) −10 (b) 5 (c) −5 (d) 10

15. The area of triangle whose vertices are (1, 2, 3), (2, 5, −1) and (−1, 1, 2) is **[Kerala (Engg.) 2002]**

(a) 150 *sq. units* (b) 145 *sq. units* (c) $\frac{\sqrt{155}}{2}$ *sq. units* (d) $\frac{155}{2}$ *sq. units*

16. Volume of a tetrahedron is K (area of one face) (length of perpendicular from the opposite vertex upon it), where K is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

17. A point moves so that the sum of its distances from the points $(4,0,0)$ and $(-4,0,0)$ remains 10. The locus of the point is

[MP PET 1988]

(a) $9x^2-25y^2+25z^2=225$ (b) $9x^2+25y^2-25z^2=225$

(c) $9x^2+25y^2+25z^2=225$ (d) $9x^2+25y^2+25z^2+225=0$

18. 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) None of these

19. All the points on the x-axis have **[MP PET 1988]**

(a) $x=0$ (b) $y=0$ (c) $x=0, y=0$ (d) $y=0, z=0$

20. The equations $|x|=p, |y|=p, |z|=p$ in xyz space represent **[Orissa JEE 2002]**

(a) Cube (b) Rhombus (c) Sphere of radius p (d) Point (p,p,p)

21. The orthocentre of the triangle with vertices (1,2,3), (2,3,1) and (3,1,2) is

(a) (1, 1, 1) (b) (2, 2, 2) (c) (6, 6, 6) (d) None of these

22. If $a+b+c=\lambda$, then circumcentre of the triangle with vertices (a,b,c); (b,c,a) and (c,a,b) is

(a) $(\lambda, \lambda, \lambda)$ (b) $(\lambda/2, \lambda/2, \lambda/2)$ (c) $(\lambda/3, \lambda/3, \lambda/3)$ (d) None of these

23. $(-1,6,6),(-4,9,6)$ are two vertices of ΔABC. If its centroid be $(-5/3, 22/3, 22/3)$, then its third vertex is

(a) $(0, 7, 10)$ (b) $(7, 0, 10)$ (c) $(10, 0, 7)$ (d) None of these

24. If points (2, 3, 4), (5, a, 6) and (7, 8, b) are collinear, then values of a and b are **[AISSE 1989]**

(a) $a=6, b=\frac{-22}{3}$ (b) $a=6, b=\frac{22}{3}$ (c) $a=\frac{22}{3}, b=6$ (d) $a=\frac{-22}{3}, b=-6$

Direction cosines and Projection

Basic Level

25. If a line makes angles of $30°$ and $45°$ with x-axis and y-axis, then the angle made by it with z-axis is

(a) 45° (b) 60° (c) 120° (d) None of these

26. If a straight line in space is equally inclined to the coordinate axes, the cosine of its angle of inclination to any one of the axes is **[MP PET 1992]**

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{2}}$

27. If the length of a vector be 21 and direction ratios be 2, –3, 6, then its direction cosines are

(a) $\frac{2}{21}, \frac{-1}{7}, \frac{2}{7}$ (b) $\frac{2}{7}, \frac{-3}{7}, \frac{6}{7}$ (c) $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$ (d) None of these

28. If O is the origin, $OP = 3$ with d.r.'s $-1, 2, -2$ then the co-ordinates of P are **[Rajasthan PET 2000]**

(a) $(-1, 2, -2)$ (b) (1, 2, 2) (c) $\left(-\frac{1}{9}, \frac{2}{9}, -\frac{2}{9}\right)$ (d) (3, 6, – 9)

29. The numbers 3, 4, 5 can be

(a) Direction cosines of a line (b) Direction ratios of a line in space

(c) Coordinates of a point on the plane $y = 4, z = 0$ (d) Co-ordinates of a point on the plane $x + y - z = 0$

30. If l, m, n are the $d.c.$'s of a line, then

(a) $l^2 + m^2 + n^2 = 0$ (b) $l^2 + m^2 + n^2 = 1$ (c) $l + m + n = 1$ (d) $l = m = n = 1$

31. If a line lies in the octant $OXYZ$ and it makes equal angles with the axes, then **[MP PET 2001]**

(a) $l = m = n = \frac{1}{\sqrt{3}}$ (b) $l = m = n = \pm\frac{1}{\sqrt{3}}$ (c) $l = m = n = -\frac{1}{\sqrt{3}}$ (d) $l = m = n = \pm\frac{1}{\sqrt{2}}$

32. If a line makes equal angle with axes, then its direction ratios will be

(a) 1, 2, 3 (b) 3, 1, 2 (c) 3, 2, 1 (d) 1, 1, 1

33. The coordinates of the point P are (x, y, z) and the direction cosines of the line OP, when O is the origin, are l, m, n. If $OP = r$, then

(a) $l = x, m = y, n = z$ (b) $l = xr, m = yr, n = zr$ (c) $x = lr, y = mr, z = nr$ (d) None of these

34. The direction ratios of the diagonals of a cube which joins the origin to the opposite corner are (when the 3 concurrent edges of the cube are coordinate axes) **[MP PET 1996]**

(a) $\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$ (b) –1, 1, –1 (c) 2, –2, 1 (d) 1, 2, 3

35. If the direction ratios of a line are 1, –3, 2, then the direction cosines of the line are **[MP PET 1997]**

(a) $\frac{1}{\sqrt{14}}, \frac{-3}{\sqrt{14}}, \frac{2}{\sqrt{14}}$ (b) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (c) $\frac{-1}{\sqrt{14}}, \frac{3}{\sqrt{14}}, \frac{-2}{\sqrt{14}}$ (d) $\frac{-1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$

36. If a line make α, β, γ with the positive direction of x, y and z-axis respectively. Then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$ is **[Orissa JEE 2002; MP PET 2002]**

(a) 1/2 (b) –1/2 (c) –1 (d) 1

37. The direction-cosines of the line joining the points (4, 3, –5) and (–2, 1, –8) are **[MP PET 2001; Kurukshetra CEE 1998]**

(a) $\left(\frac{6}{7}, \frac{2}{7}, \frac{3}{7}\right)$ (b) $\left(\frac{2}{7}, \frac{3}{7}, \frac{6}{7}\right)$ (c) $\left(\frac{6}{7}, \frac{3}{7}, \frac{2}{7}\right)$ (d) None of these

38. The direction ratios of the line joining the points (4, 3, –5) and (–2, 1, –8) are **[AI CBSE 1984; MP PET 1988]**

(a) $\left(\frac{6}{7}, \frac{2}{7}, \frac{3}{7}\right)$ (b) 6, 2, 3 (c) 2, 4, –13 (d) None of these

39. The coordinates of a point *P* are (3, 12, 4) with respect to origin *O*, then the direction cosines of *OP* are **[MP PET 1996]**

(a) 3, 12, 4 (b) $\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$ (c) $\frac{3}{\sqrt{13}}, \frac{1}{\sqrt{13}}, \frac{2}{\sqrt{13}}$ (d) $\frac{3}{13}, \frac{12}{13}, \frac{4}{13}$

40. The direction cosines of a line segment *AB* are $\frac{-2}{\sqrt{17}}, \frac{3}{\sqrt{17}}, \frac{-2}{\sqrt{17}}$. If $AB = \sqrt{17}$ and the coordinates of *A* are (3, –6, 10), then the coordinates of *B* are

(a) (1, –2, 4) (b) (2, 5, 8) (c) (–1, 3, –8) (d) (1, –3, 8)

41. If $\left(\frac{1}{2}, \frac{1}{3}, n\right)$ are the direction cosines of a line, then the value of *n* is **[Kerala (Engg.) 2002]**

(a) $\frac{\sqrt{23}}{6}$ (b) $\frac{23}{6}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

42. If a line makes the angle α, β, γ with three dimensional coordinate axes respectively, then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$

[MP PET 1994,95,99; Rajasthan PET 2003]

(a) –2 (b) –1 (c) 1 (d) 2

43. A line makes angles of 45° and 60° with the positive axes of *X* and *Y* respectively. The angle made by the same line with the positive axis of *Z*, is **[MP PET 1997]**

(a) 30° or 60° (b) 60° or 90° (c) 90° or 120° (d) 60° or 120°

44. If α, β, γ be the angles which a line makes with the positive direction of coordinate axes, then $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma =$

[Rajasthan PET 2000; AMU 2002; MP PET 1989,98,2000,03; Kerala (Engg.) 2001]

(a) 2 (b) 1 (c) 3 (d) 0

45. A line makes angles α, β, γ with the coordinate axes. If $\alpha + \beta = 90°$, then $\gamma =$

(a) 0° (b) 90° (c) 180° (d) None of these

46. The coordinates of the points *P* and *Q* are (x_1, y_1, z_1) and (x_2, y_2, z_2) respectively, then the projection of the line *PQ* on the line whose direction cosines are *l*, *m*, *n*, will be

(a) $(x_2 - x_1)l + (y_2 - y_1)m + (z_2 - z_1)n$ (b) $\left(\frac{x_2 - x_1}{l}\right) + \left(\frac{y_2 - y_1}{m}\right) + \left(\frac{z_2 - z_1}{n}\right)$

(c) $\frac{x_1}{l} + \frac{y_1}{m} + \frac{z_1}{n}$ (d) $\frac{x_2}{l} + \frac{y_2}{m} + \frac{z_2}{n}$

47. The projection of the line segment joining the points (–1, 0, 3) and (2, 5, 1) on the line whose direction ratios are 6, 2, 3, is

[AI CBSE 1985]

(a) 10/7 (b) 22/7 (c) 18/7 (d) None of these

48. The projection of any line on coordinate axes be respectively 3, 4, 5, then its length is **[MP PET 1995; Rajasthan PET 2001**

(a) 12 (b) 50 (c) $5\sqrt{2}$ (d) None of these

49. If θ is the angle between the lines *AB* and *CD*, then projection of line segment *AB* on line *CD* is **[MP PET 1995]**

(a) $AB \sin\theta$ (b) $AB \cos\theta$ (c) $AB \tan\theta$ (d) $CD \cos\theta$

50. The projections of a line on the co-ordinate axes are 4, 6, 12. The direction cosines of the line are

(a) $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$ (b) 2, 3, 6 (c) $\frac{2}{11}, \frac{3}{11}, \frac{6}{11}$ (d) None of these

51. The projections of segment PQ on the coordinate planes are –9, 12, –8 respectively. The direction cosines of PQ are **[Pb. CET 1998]**

(a) $< -\frac{9}{\sqrt{(17)}}, \frac{12}{\sqrt{(17)}}, \frac{-8}{\sqrt{(17)}} >$ (b) $< -9, 12, -8 >$

(c) $< \frac{-9}{289}, \frac{12}{289}, \frac{-8}{289} >$ (d) $< \frac{-9}{17}, \frac{12}{17}, \frac{-8}{17} >$

52. The projections of a line segment on x, y, z axes are 12, 4, 3. The length and the direction cosines of the line segments are

[Kerala (Engg.) 2000]

(a) $13, < 12/13, 4/13, 3/13 >$ (b) $19, < 12/19, 4/19, 3/19 >$ (c) $11, < 12/11, 4/11, 3/11 >$ (d) None of these

53. The coordinates of A and B be (1, 2, 3) and (7, 8, 7), then the projections of the line segment AB on the coordinate axes are

(a) 6, 6, 4 (b) 4, 6, 4 (c) 3, 3, 2 (d) 2, 3, 2

54. A line segment (vector) has length 21 and direction ratios (2, –3, 6). If the line makes an obtuse angle with x-axis, the components of the line (vector) are

(a) 6, –9, 18 (b) 2, –3, 6 (c) –18, 27, –54 (d) –6, 9, –18

Angle between Two Lines

Basic Level

55. The angle between the pair of lines with direction ratios (1, 1, 2) and $(\sqrt{3}-1, -\sqrt{3}-1, 4)$ is **[MP PET 1997, 2000]**

(a) 30° (b) 45° (c) 60° (d) 90°

56. The angle between a line with direction ratios $2:2:1$ and a line joining (3, 1, 4) to (7, 2, 12) is **[DCE 2002]**

(a) $\cos^{-1}(2/3)$ (b) $\cos^{-1}(-2/3)$ (c) $\tan^{-1}(2/3)$ (d) None of these

57. The angle between the lines whose direction cosines are proportional to (1, 2, 1) and (2, –3, 6) is

(a) $\cos^{-1}\left(\frac{2}{7\sqrt{6}}\right)$ (b) $\cos^{-1}\left(\frac{1}{7\sqrt{6}}\right)$ (c) $\cos^{-1}\left(\frac{3}{7\sqrt{6}}\right)$ (d) $\cos^{-1}\left(\frac{5}{7\sqrt{6}}\right)$

58. If the vertices of a triangle are A (1, 4, 2), B(–2, 1, 2), C(2, –3, 4), then the angle B is equal to

(a) $\cos^{-1}(1/\sqrt{3})$ (b) $\pi/2$ (c) $\cos^{-1}(\sqrt{6}/3)$ (d) $\cos^{-1}\sqrt{3}$

59. If the coordinates of the points P, Q, R, S be (1, 2, 3), (4, 5, 7), (–4, 3, –6) and (2, 0, 2) respectively, then

(a) $PQ \parallel RS$ (b) $PQ \perp RS$ (c) $PQ = RS$ (d) None of these

60. If the coordinates of the points A, B, C, D be (1, 2, 3), (4, 5, 7), (–4, 3, –6) and (2, 9, 2) respectively, then the angle between the lines AB and CD is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) None of these

61. If the angle between the lines whose direction ratios are $2, -1, 2$ and $a, 3, 5$ be 45°, then $a =$

(a) 1 (b) 2 (c) 3 (d) 4

62. If O be the origin and $P(2,3,4)$ and $Q(1,b,1)$ be two points such that $OP \perp OQ$, then $b =$

(a) 2 (b) –2 (c) No such real b exists (d) None of these

63. If d.r.'s of two straight lines are 5, –12, 13 and –3, 4, 5 then, angle between them is **[Rajasthan PET 2001]**

(a) $\cos^{-1}\left(\frac{2}{65}\right)$ (b) $\cos^{-1}\left(\frac{1}{65}\right)$ (c) $\cos^{-1}\left(\frac{3}{65}\right)$ (d) $\frac{\pi}{3}$

64. If direction ratio of two lines are a_1, b_1, c_1 and a_2, b_2, c_2 then these lines are parallel if and only if

(a) $a_1 = a_2, b_1 = b_2, c_1 = c_2$ (b) $a_1a_2 + b_1b_2 + c_1c_2 = 0$ (c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (d) None of these

65. If $A(k,1,-1)$, $B(2k,0,2)$ and $C(2+2k,k,1)$ be such that the line $AB \perp BC$, then the value of k will be

(a) 1 (b) 2 (c) 3 (d) 0

66. $A(a,7,10)$, $B(-1,6,6)$ and $C(-4,9,6)$ are the vertices of a right angled isosceles triangle. If $\angle ABC = 90°$, then $a =$

(a) 0 (b) 2 (c) –1 (d) –3

Advance Level

67. The angle between two diagonals of a cube will be **[MP PET 1996, 97, 2000; Rajasthan PET 2000,02]**

(a) $\sin^{-1}\frac{1}{3}$ (b) $\cos^{-1}\frac{1}{3}$ (c) Constant (d) Variable

68. If a line makes angles $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube, then the value of $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta =$

[Rajasthan PET 2002]

(a) 1 (b) $\frac{4}{3}$ (c) Constant (d) Variable

69. 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

[MP PET 1993; Rajasthan PET 2001]

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{3}$

70. If three mutually perpendicular lines have direction cosines $(l_1, m_1, n_1), (l_2, m_2, n_2)$, and (l_3, m_3, n_3), then the line having direction cosines $l_1 + l_2 + l_3, m_1 + m_2 + m_3$ and $n_1 + n_2 + n_3$ make an angle of ....with each other

(a) 0° (b) 30° (c) 60° (d) 90°

71. The straight lines whose direction cosines are given by $al + bm + cn = 0$, $fmn + gnl + hlm = 0$ are perpendicular, if

(a) $\frac{f}{a} + \frac{g}{b} + \frac{h}{c} = 0$ (b) $\sqrt{\frac{a}{f}} + \sqrt{\frac{b}{g}} + \sqrt{\frac{c}{h}} = 0$ (c) $\sqrt{af} = \sqrt{bg} = \sqrt{ch}$ (d) $\sqrt{\frac{a}{f}} = \sqrt{\frac{b}{g}} = \sqrt{\frac{c}{h}}$

72. The angle between the lines whose direction cosines are connected by the relations $l+m+n=0$ and $2lm + 2nl - mn = 0$, is

(a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) π (d) None of these

73. $A(3,2,0)$, $B(5,3,2)$, $C(-9,6,-3)$ are three points forming a triangle and AD is the bisector of the $\angle BAC$, then coordinates of D are

(a) $\left(\frac{17}{16}, \frac{57}{16}, \frac{28}{16}\right)$ (b) $\left(\frac{38}{16}, \frac{57}{16}, \frac{17}{16}\right)$ (c) $\left(\frac{38}{16}, \frac{17}{16}, \frac{57}{16}\right)$ (d) $\left(\frac{57}{16}, \frac{38}{16}, \frac{17}{16}\right)$

74. The direction cosines of two lines at right angles are $< l_1, m_1, n_1 >$ and $< l_2, m_2, n_2 >$. Then the d.c. of a line $\perp$ to both the given lines are

(a) $< m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2m_1 >$ (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

75. Three lines drawn from origin with direction cosines $l_1, m_1, n_1 ; l_2, m_2, n_2 ; l_3, m_3, n_3$ are coplanar iff $\begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix} = 0$, since

(a) All lines pass through origin (b) It is possible to find a line perpendicular to all these lines

(c) Intersecting lines are coplanar (d) None of these

76. The direction cosines of a variable line in two adjacent positions are l, m, n and $l + \delta l, m + \delta m, n + \delta n$. If angle between these two positions is $\delta\theta$, where $\delta\theta$ is a small angle, then $\delta\theta^2$ is equal to

(a) $\delta l^2 + \delta m^2 + \delta n^2$ (b) $\delta l + \delta m + \delta n$ (c) $\delta l \,.\, \delta m + \delta m \,.\, \delta n + \delta n \,.\, \delta l$ (d) None of these

77. If direction cosines of two lines *OA* and *OB* are respectively proportional to 1, –2, –1 and 3, –2, 3 then direction cosine of line perpendicular to given both lines are

(a) $\pm 4/\sqrt{29}, \pm 3/\sqrt{29}, \pm 2/\sqrt{29},$ (b) $\pm 4/\sqrt{29}, \pm 3/\sqrt{29}, \mp 2/\sqrt{29}$

(c) $\pm 4/\sqrt{29}, \pm 2/\sqrt{29}, \pm 3/\sqrt{29},$ (d) None of these

78. 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) $-\frac{1}{3}, -\frac{2}{3}, \frac{2}{3}$

Straight Line

Basic Level

79. The equation of straight line passing through the point (a, b, c) and parallel to *z*-axis, is **[MP PET 1995]**

(a) $\frac{x-a}{1} = \frac{y-b}{1} = \frac{z-c}{0}$ (b) $\frac{x-a}{0} = \frac{y-b}{1} = \frac{z-c}{1}$ (c) $\frac{x-a}{1} = \frac{y-b}{0} = \frac{z-c}{0}$ (d) $\frac{x-a}{0} = \frac{y-b}{0} = \frac{z-c}{1}$

80. Equation of *x*-axis is **[MP PET 2002]**

(a) $\frac{x}{1} = \frac{y}{1} = \frac{z}{1}$ (b) $\frac{x}{0} = \frac{y}{1} = \frac{z}{1}$ (c) $\frac{x}{1} = \frac{y}{0} = \frac{z}{0}$ (d) $\frac{x}{0} = \frac{y}{0} = \frac{z}{1}$

81. The equation of straight line passing through the points (*a*, *b*, *c*) and $(a-b, b-c, c-a)$, is **[MP PET 1994]**

(a) $\frac{x-a}{a-b} = \frac{y-b}{b-c} = \frac{z-c}{c-a}$ (b) $\frac{x-a}{b} = \frac{y-b}{c} = \frac{z-c}{a}$ (c) $\frac{x-a}{a} = \frac{y-b}{b} = \frac{z-c}{c}$ (d) $\frac{x-a}{2a-b} = \frac{y-b}{2b-c} = \frac{z-c}{2c-a}$

82. The equation of a line passing through the point (–3, 2, –4) and equally inclined to the axes, are

(a) $x - 3 = y + 2 = z - 4$ (b) $x + 3 = y - 2 = z + 4$ (c) $\frac{x+3}{1} = \frac{y-2}{2} = \frac{z+4}{3}$ (d) None of these

83. The straight line through (*a*, *b*, *c*) and parallel to *x*-axis are **[DCE 1992]**

(a) $\frac{x-a}{1}=\frac{y-b}{0}=\frac{z-c}{0}$ (b) $\frac{x-a}{0}=\frac{y-b}{1}=\frac{z-c}{0}$ (c) $\frac{x-a}{0}=\frac{y-b}{0}=\frac{z-c}{1}$ (d) $\frac{x-a}{1}=\frac{y-b}{1}=\frac{z-c}{1}$

84. Equation of the line passing through the point $(1, 2, 3)$ and parallel to the line $\frac{x-6}{12}=\frac{y-2}{4}=\frac{z+7}{5}$ is given by

(a) $\frac{x+1}{12}=\frac{y+2}{4}=\frac{z+3}{5}$ (b) $\frac{x-1}{l}=\frac{y-2}{m}=\frac{z-3}{n}$, where $12l+4m+5n=0$

(c) $\frac{x-1}{12}=\frac{y-2}{4}=\frac{z-3}{5}$ (d) None of these

85. Let G be the centroid of the triangle formed by the points (1, 2, 0), (2, 1, 1), (0, 0, 2). Then equation of the line OG is given by

(a) $x=y=z$ (b) $\frac{x-1}{1}=\frac{y}{1}=\frac{z}{1}$ (c) $\frac{x-1}{1}=\frac{y-1}{1}=\frac{z-1}{0}$ (d) None of these

86. The direction cosines of the line $\frac{3x+1}{-3}=\frac{3y+2}{6}=\frac{z}{-1}$ are

(a) $\left(\frac{1}{3},\frac{2}{3},0\right)$ (b) $\left(-1,\frac{2}{3},1\right)$ (c) $\left(-\frac{1}{2},1,-\frac{1}{2}\right)$ (d) $\left(-\frac{1}{\sqrt{6}},\frac{2}{\sqrt{6}},-\frac{1}{\sqrt{6}}\right)$

87. The direction cosines of the line $x=y=z$ are **[MP PET 1989]**

(a) $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$ (b) $\frac{1}{3},\frac{1}{3},\frac{1}{3}$ (c) 1, 1, 1 (d) None of these

88. The direction ratio's of the line $x-y+z-5=0=x-3y-6$ are **[MP PET 1999]**

(a) 3, 1, –2 (b) 2, –4, 1 (c) $\frac{3}{\sqrt{14}},\frac{1}{\sqrt{14}},\frac{-2}{\sqrt{14}}$ (d) $\frac{2}{\sqrt{41}},\frac{-4}{\sqrt{41}},\frac{1}{\sqrt{41}}$

89. The angle between two lines $\frac{x+1}{2}=\frac{y+3}{2}=\frac{z-4}{-1}$ and $\frac{x-4}{1}=\frac{y+4}{2}=\frac{z+1}{2}$ is **[MP PET 1996]**

(a) $\cos^{-1}\left(\frac{1}{9}\right)$ (b) $\cos^{-1}\left(\frac{2}{9}\right)$ (c) $\cos^{-1}\left(\frac{3}{9}\right)$ (d) $\cos^{-1}\left(\frac{4}{9}\right)$

90. The angle between the lines $\frac{x+4}{1}=\frac{y-3}{2}=\frac{z+2}{3}$ and $\frac{x}{3}=\frac{y-1}{-2}=\frac{z}{1}$ is

(a) $\sin^{-1}\left(\frac{1}{7}\right)$ (b) $\cos^{-1}\left(\frac{2}{7}\right)$ (c) $\cos^{-1}\left(\frac{1}{7}\right)$ (d) None of these

91. The angle between the lines $\frac{x}{1}=\frac{y}{0}=\frac{z}{-1}$ and $\frac{x}{3}=\frac{y}{4}=\frac{z}{5}$ is

(a) $\cos^{-1}\frac{1}{5}$ (b) $\cos^{-1}\frac{1}{3}$ (c) $\cos^{-1}\frac{1}{2}$ (d) $\cos^{-1}\frac{1}{4}$

92. The value of λ for which the lines $\frac{x-1}{1}=\frac{y-2}{\lambda}=\frac{z+1}{-1}$ and $\frac{x+1}{-\lambda}=\frac{y+1}{2}=\frac{z-2}{1}$ are perpendicular to each other is

(a) 0 (b) 1 (c) –1 (d) None of these

93. The angle between the straight lines $\frac{x+1}{2}=\frac{y-2}{5}=\frac{z+3}{4}$ and $\frac{x-1}{1}=\frac{y+2}{2}=\frac{z-3}{-3}$ is **[MP PET 2000]**

(a) 45° (b) 30° (c) 60° (d) 90°

94. The angle between the lines $2x=3y=-z$ and $6x=-y=-4z$, is **[MP PET 1994,99]**

(a) 0° (b) 30° (c) 45° (d) 90°

95. The angle between the lines $x=1, y=2$ and $y=-1$ and $z=0$ is **[Kurukshetra CEE 1993]**

(a) 90° (b) 30° (c) 60° (d) 0°

96. The straight line $\frac{x-3}{3}=\frac{y-2}{1}=\frac{z-1}{0}$ is **[Rajasthan PET 2002]**

(a) Parallel to x-axis (b) Parallel to y-axis (c) Parallel to z-axis (d) Perpendicular to z-axis

97. The lines $\frac{x-1}{2}=\frac{y-1}{3}=\frac{z-3}{0}$ and $\frac{x-2}{0}=\frac{y-3}{0}=\frac{z-4}{1}$ are

(a) Parallel (b) Skew (c) Coincident (d) Perpendicular

98. 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

99. The angle between the lines $\frac{x-2}{3}=\frac{y+1}{-2}, z=2$ and $\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$ is

(a) $\pi/2$ (b) $\pi/3$ (c) $\pi/6$ (d) None of these

100. The lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and $\frac{x-1}{-2}=\frac{y-2}{-4}=\frac{z-3}{-6}$ are **[Kurukshetra CEE 2000]**

(a) Parallel (b) Intersecting (c) Skew (d) Coincident

101. The lines $\frac{x-1}{2}=\frac{y-2}{4}=\frac{z-3}{7}$ and $\frac{x-1}{4}=\frac{y-2}{5}=\frac{z-3}{7}$ are

(a) Parallel (b) Intersecting (c) Skew (d) Perpendicular

102. Lines $\mathbf{r}=\mathbf{a}_1+t\mathbf{b}_1$ and $\mathbf{r}=\mathbf{a}_2+s\mathbf{b}_2$ are parallel iff **[Kurukshetra CEE 1992]**

(a) $\mathbf{b}_1$ is parallel to $\mathbf{a}_2-\mathbf{a}_1$ (b) $\mathbf{b}_2$ is parallel to $\mathbf{a}_2-\mathbf{a}_1$

(c) $\mathbf{b}_1=\lambda\mathbf{b}_2$ for some real λ (d) None of these

103. The equation of the line passing through the points $a_1\mathbf{i}+a_2\mathbf{j}+a_3\mathbf{k}$ and $b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k}$ **[Rajasthan PET 2002]**

(a) $(a_1\mathbf{i}+a_2\mathbf{j}+a_3\mathbf{k})+t(b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k})$ (b) $(a_1\mathbf{i}+a_2\mathbf{j}+a_3\mathbf{k})-t(b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k})$

(c) $a_1(1-t)\mathbf{i}+a_2(1-t)\mathbf{j}+a_3(1-t)\mathbf{k}+(b_1\mathbf{i}+b_2\mathbf{j}+b_3\mathbf{k})\,t$ (d) None of these

104. The vector equation of the line joining the points $\mathbf{i}-2\mathbf{j}+\mathbf{k}$ and $-2\mathbf{j}+3\mathbf{k}$ is **[MP PET 2003]**

(a) $\mathbf{r}=t(\mathbf{i}+\mathbf{j}+\mathbf{k})$ (b) $\mathbf{r}=t_1(\mathbf{i}-2\mathbf{j}+\mathbf{k})+t_2(3\mathbf{k}-2\mathbf{j})$ (c) $\mathbf{r}=(\mathbf{i}-2\mathbf{j}+\mathbf{k})+t(2\mathbf{k}-\mathbf{i})$ (d) $r=t(2\mathbf{k}-\mathbf{i})$

105. The acute angle between the line joining the points $(2,1,-3),(-3,1,7)$ and a line parallel to $\frac{x-1}{3}=\frac{y}{4}=\frac{z+3}{5}$ through the point $(-1,0,4)$ is **[MP PET 1998]**

(a) $\cos^{-1}\left(\frac{7}{5\sqrt{10}}\right)$ (b) $\cos^{-1}\left(\frac{1}{\sqrt{10}}\right)$ (c) $\cos^{-1}\left(\frac{3}{5\sqrt{10}}\right)$ (d) $\cos^{-1}\left(\frac{1}{5\sqrt{10}}\right)$

106. The shortest distance between the lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$ and $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$ is **[MP PET 2002]**

(a) $\sqrt{30}$ (b) $2\sqrt{30}$ (c) $5\sqrt{30}$ (d) $3\sqrt{30}$

107. 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

108. The lines l_1 and l_2 intersect. The shortest distance between them is

(a) Positive (b) Zero (c) Negative (d) Infinity

109. The shortest distance between two straight lines given by $\frac{x-4}{1}=\frac{y+1}{2}=\frac{z-0}{-3}$ and $\frac{x-1}{1}=\frac{y+1}{4}=\frac{z-2}{-5}$ is **[Pb. CET 2001]**

(a) $\frac{2}{\sqrt{5}}$ (b) $\frac{3}{\sqrt{5}}$ (c) $\frac{6}{\sqrt{5}}$ (d) None of these

110. The shortest distance between the lines $\mathbf{r}=(3\mathbf{i}-2\mathbf{j}-2\mathbf{k})+\mathbf{i}\,t$ and $\mathbf{r}=\mathbf{i}-\mathbf{j}+2\mathbf{k}+\mathbf{j}s$ (t and s being parameters) is **[AMU 199**

(a) $\sqrt{21}$ (b) $\sqrt{102}$ (c) 4 (d) 3

Advance Level

111. The equation of the line passing through the point (1, 2, –4) and perpendicular to the two lines $\frac{x-8}{2}=\frac{y+19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{-2}=\frac{y-29}{8}=\frac{z-5}{-5}$, will be **[AI CBSE 1983]**

(a) $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}$ (b) $\frac{x-1}{-2}=\frac{y-2}{3}=\frac{z+4}{8}$ (c) $\frac{x-1}{3}=\frac{y-2}{2}=\frac{z+4}{8}$ (d) None of these

112. The equation of straight line $3x+2y-z-4=0$; $4x+y-2z+3=0$ in the symmetrical form is

(a) $\frac{x-2}{3}=\frac{y-5}{2}=\frac{z}{5}$ (b) $\frac{x+2}{3}=\frac{y-5}{-2}=\frac{z}{5}$ (c) $\frac{x+2}{3}=\frac{y-5}{2}=\frac{z}{5}$ (d) None of these

113. The point of intersection of lines $\frac{x-4}{5}=\frac{y-1}{2}=\frac{z}{1}$ and $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ is **[AISSE 1986]**

(a) $(-1,-1,-1)$ (b) $(-1,-1,1)$ (c) $(1,-1,-1)$ (d) $(-1,1,-1)$

114. The length and foot of the perpendicular from the point $(2,-1,5)$ to the line $\frac{x-11}{10}=\frac{y+2}{-4}=\frac{z+8}{-11}$ are **[DSSE 1987]**

(a) $\sqrt{14}, (1,2,-3)$ (b) $\sqrt{14}, (1,-2,3)$ (c) $\sqrt{14}, (1,2,3)$ (d) None of these

115. The perpendicular distance of the point (2, 4, –1) from the line $\frac{x+5}{1}=\frac{y+3}{4}=\frac{z-6}{-9}$ is **[Kurukshetra CEE 1996]**

(a) 3 (b) 5 (c) 7 (d) 9

116. Distance of the point (x_1, y_1, z_1) from the line $\frac{x-x_2}{l}=\frac{y-y_2}{m}=\frac{z-z_2}{n}$, where *l*, *m* and *n* are the direction cosines of line is

(a) $\sqrt{(x_1-x_2)^2+(y_1-y_2)^2+(z_1-z_2)^2-[l(x_1-x_2)+m(y_1-y_2)+n(z_1-z_2)]^2}$

(b) $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$

(c) $\sqrt{(x_2-x_1)l+(y_2-y_1)m+(z_2-z_1)n}$

(d) None of these

117. The length of the perpendicular from point (1, 2, 3) to the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ is **[MP PET 1997]**

(a) 5 (b) 6 (c) 7 (d) 8

118. The foot of the perpendicular from (0, 2, 3) to the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$ is

(a) (–2, 3, 4) (b) (2, –1, 3) (c) (2, 3, –1) (d) (3, 2, –1)

119. The foot of the perpendicular from (1, 2, 3) to the line joining the points (6, 7, 7) and (9, 9, 5) is

(a) (5, 3, 9) (b) (3, 5, 9) (c) (3, 9, 5) (d) (3, 9, 9)

120. If the equation of a line through a point **a** and parallel to vector **b** is $\mathbf{r}=\mathbf{a}+t\mathbf{b}$, where *t* is a parameter, then its perpendicular distance from the point **c** is **[MP PET 1998]**

(a) $|(\mathbf{c}-\mathbf{b})\times\mathbf{a}|\div|\mathbf{a}|$ (b) $|(\mathbf{c}-\mathbf{a})\times\mathbf{b}|\div|\mathbf{b}|$ (c) $|(\mathbf{a}-\mathbf{b})\times\mathbf{c}|\div|\mathbf{c}|$ (d) $|(\mathbf{a}-\mathbf{b})\times\mathbf{c}|\div|\mathbf{a}+\mathbf{c}|$

121. The distance of the point $B(\mathbf{i}+2\mathbf{j}+3\mathbf{k})$ from the line which is passing through $A(4\mathbf{i}+2\mathbf{j}+2\mathbf{k})$ and which is parallel to the vector $\vec{C}=2\mathbf{i}+3\mathbf{j}+6\mathbf{k}$ is **[Roorkee 1993]**

(a) 10 (b) $\sqrt{10}$ (c) 100 (d) None of these

Plane

Basic Level

122. The ratio in which the line joining the points (*a*, *b*, *c*) and (–*a*, –*c*, –*b*) is divided by the *xy*-plane is **[MP PET 1994; Him.**

(a) $a:b$ (b) $b:c$ (c) $c:a$ (d) $c:b$

123. The ratio in which the line joining (2, 4, 5) (3, 5, –4) is divided by the *yz*-plane is **[MP PET 2002; Rajasthan PET 2002]**

(a) $2:3$ (b) $3:2$ (c) $-2:3$ (d) $4:-3$

124. *xy*-plane divides the line joining the points (2, 4, 5) and (–4, 3, –2) in the ratio **[MP PET 1988]**

(a) $3:5$ (b) $5:2$ (c) $1:3$ (d) $3:4$

125. The coordinates of the point where the line through *P* (3, 4, 1) and *Q* (5, 1, 6) crosses the *xy*-plane are **[MP PET 1997]**

(a) $\frac{3}{5},\frac{13}{5},\frac{23}{5}$ (b) $\frac{13}{5},\frac{23}{5},\frac{3}{5}$ (c) $\frac{13}{5},\frac{23}{5},0$ (d) $\frac{13}{5},0,0$

126. The plane *XOZ* divides the join of (1, –1, 5) and (2, 3, 4) in the ratio $\lambda:1$, then λ is **[Pb. CET 1988]**

(a) –3 (b) 3 (c) $-\frac{1}{3}$ (d) $\frac{1}{3}$

127. XOZ plane divides the join of (2, 3, 1) and (6, 7, 1) in the ratio **[EAMCET 2003]**

(a) $3:7$ (b) $2:7$ (c) $-3:7$ (d) $-2:7$

128. The plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=3$ meets the coordinate axes in *A, B, C*. The centroid of the triangle *ABC* is

(a) $\left(\frac{a}{3},\frac{b}{3},\frac{c}{3}\right)$ (b) $\left(\frac{3}{a},\frac{3}{b},\frac{3}{c}\right)$ (c) $\left(\frac{1}{a},\frac{1}{b},\frac{1}{c}\right)$ (d) (a,b,c)

129. The ratio in which the plane $\mathbf{r}.(\mathbf{i}-2\mathbf{j}+3\mathbf{k})=17$ divides the line joining the points $-2\mathbf{i}+4\mathbf{j}+7\mathbf{k}$ and $3\mathbf{i}-5\mathbf{j}+8\mathbf{k}$ is

[Kurukshetra CEE 1996; DCE 1999]

(a) $1:5$ (b) $1:10$ (c) $3:5$ (d) $3:10$

130. If a plane cuts off intercepts $OA=a$, $OB=b$, $OC=c$ from the coordinate axes, then the area of the triangle *ABC* =

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

131. The plane $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=1$ cuts the axes in *A, B, C,* then the area of the ΔABC is **[MP PET 2000]**

(a) $\sqrt{29}$ (b) $\sqrt{41}$ (c) $\sqrt{61}$ (d) None of these

132. The volume of the tetrahedron included between the plane $2x-3y+4z-12=0$ and the three coordinate planes is

(a) $3\sqrt{(29)}$ (b) $6\sqrt{(29)}$ (c) 12 (d) None of these

133. A point located in space moves in such a way that sum of its distances from *xy*-and *yz* plane is equal to distance from *zx* plane, the locus of the point is

(a) $x-y+z=2$ (b) $x+y-z=0$ (c) $x+y-z=2$ (d) $x-y+z=0$

134. The equation of a plane parallel to *x*- axis is **[DCE 2001]**

(a) $ax+by+cz+d=0$ (b) $ax+by+d=0$ (c) $by+cz+d=0$ (d) $ax+cz+d=0$

135. In the space the equation $by+cz+d=0$ represents a plane perpendicular to the plane **[EAMCET 2002]**

(a) *YOZ* (b) *Z=k* (c) *ZOX* (d) *XOY*

136. The intercepts of the plane $5x-3y+6z=60$ on the coordinate axes are **[MP PET 2001]**

(a) (10, 20, –10) (b) (10, –20, 12) (c) (12, –20, 10) (d) (12, 20, –10)

137. The coordinates of the points *A* and *B* are (2, 3, 4) and (–2, 5, –4) respectively. If a point *P* moves, so that $PA^2-PB^2=k$ where k is constant, then the locus of *P* is

(a) A line (b) A plane (c) A sphere (d) None of these

138. In a three dimensional *xyz* space the equation $x^2-5x+6=0$ represents **[Orissa JEE 2002]**

(a) Points (b) Plane (c) Curves (d) Pair of straight line

139. The equation of *yz*-plane is **[MP PET 1988]**

(a) $x=0$ (b) $y=0$ (c) $z=0$ (d) $x+y+z=0$

140. The intercepts of the plane $2x-3y+4z=12$ on the coordinate axes are given by

(a) 2, –3, 4 (b) 6, –4, –3 (c) 6, –4, 3 (d) 3, –2, 1.5

141. The locus of the point (*x, y, z,*) for which $z = k$, is

(a) A plane parallel to *xy* plane at a distance *k* from it (b) A plane parallel to *yz* plane at a distance *k* from it

(c) A plane parallel to *zx* plane at a distance *k* from it (d) A line parallel to *z*-axis at a distance *k* from it

142. A point (*x*, y, z) moves parallel to *x*- axis. Which of the three variables *x, y, z* remains fixed

(a) *x* (b) *x* and *y* (c) *y* and *z* (d) *z* and *x*

143. If **a**, **b**, **c** are three non-coplanar vectors, then the vector equation $\mathbf{r} = (1 - p - q)\,\mathbf{a} + p\mathbf{b} + q\mathbf{c}$ represents a **[EAMCET 2003]**

(a) Straight line (b) Plane

(c) Plane passing through the origin (d) Sphere

144. The direction cosines of the normal to the plane $3x + 4y + 12z = 52$ will be **[MP PET 1997]**

(a) 3, 4, 12 (b) $-3, -4, -12$ (c) $\frac{3}{13}, \frac{4}{13}, \frac{12}{13}$ (d) $\frac{3}{\sqrt{13}}, \frac{4}{\sqrt{13}}, \frac{12}{\sqrt{13}}$

145. The direction cosines of the normal to the plane $x + 2y - 3z + 4 = 0$ are **[MP PET 1996]**

(a) $\frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (b) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (c) $-\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (d) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, -\frac{3}{\sqrt{14}}$

146. Normal form of the plane $2x + 6y + 3z = 1$ is

(a) $\frac{2}{7}x + \frac{6}{7}y + \frac{3}{7}z = 1$ (b) $\frac{2}{7}x + \frac{6}{7}y + \frac{3}{7}z = \frac{1}{7}$ (c) $\frac{2}{7}x + \frac{6}{7}y + \frac{3}{7}z = 0$ (d) None of these

147. The equation of a plane which cuts equal intercepts of unit length on the axes, is **[MP PET 1996]**

(a) $x + y + z = 0$ (b) $x + y + z = 1$ (c) $x + y - z = 1$ (d) $\frac{x}{a} + \frac{y}{a} + \frac{z}{a} = 1$

148. The equation of the plane which is parallel to *y*- axis and cuts off intercepts of length 2 and 3 from *x*-axis and *z*-axis is

(a) $3x + 2z = 1$ (b) $3x + 2z = 6$ (c) $2x + 3z = 6$ (d) $3x + 2z = 0$

149. A planes π makes intercepts 3 and 4 respectively on *z*-axis and *x*-axis. If π is parallel to *y*- axis, then its equation is **[EAMCET 2003]**

(a) $3x + 4z = 12$ (b) $3z + 4x = 12$ (c) $3y + 4z = 12$ (d) $3z + 4y = 12$

150. The equation of the plane through the three points (1,1, 1), (1, –1, 1), and (–7, –3, –5), is **[AISSE 1984]**

(a) $3x - 4z + 1 = 0$ (b) $3x - 4y + 1 = 0$ (c) $3x + 4y + 1 = 0$ (d) None of these

151. The equation of the plane through (1, 2, 3) and parallel to the plane $2x + 3y - 4z = 0$ is **[MP PET 1990]**

(a) $2x + 3y + 4z = 4$ (b) $2x + 3y + 4z + 4 = 0$ (c) $2x - 3y + 4z + 4 = 0$ (d) $2x + 3y - 4z + 4 = 0$

152. The equation of the plane through (2, 3, 4) and parallel to the plane $x + 2y + 4z = 5$ is**[Kurukshetra CEE 1999; MP PET 199**

(a) $x + 2y + 4z = 10$ (b) $x + 2y + 4z = 3$ (c) $x + y + 2z = 2$ (d) $x + 2y + 4z = 24$

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

[AISSE 1987]

(a) $2x - 4y + 3z - 8 = 0$ (b) $2x - 4y - 3z + 8 = 0$ (c) $2x + 4y + 3z + 8 = 0$ (d) None of theses

154. The line drawn from (4, –1, 2) to the point (–3, 2, 3) meets a plane at right angles at the point (–10, 5, 4), then the equation of plane is

[DSSE 1985]

(a) $7x-3y-z+89=0$ (b) $7x+3y+z+89=0$ (c) $7x-3y+z+89=0$ (d) None of these

155. $x+y+z+2=0$ together with $x+y+z+3=0$ represents in space **[MP PET 1989]**

(a) A line (b) A point (c) A plane (d) None of these

156. The equation of the plane which contains the line of intersection of the planes $x+2y+3z-4=0$ and $2x+y-z+5=0$ and which is perpendicular to the plane $5x+3y-6z+8=0$, is **[DSSE 1987]**

(a) $33x+50y+45z-41=0$ (b) $33x+45y+50z+41=0$ (c) $45x+45y+50z-41=0$ (d) $33x+45y+50z-41=0$

157. The equation of the planes passing through the line of intersection of the planes $3x-y-4z=0$ and $x+3y+6=0$, whose distance from the origin is 1, are

(a) $x-2y-2z-3=0, 2x+y-2z+3=0$ (b) $x-2y+2z-3=0, 2x+y+2z+3=0$

(c) $x+2y-2z-3=0, 2x-y-2z+3=0$ (d) None of these

158. The equation of the plane which passes through the point (2, 1, 4) and parallel to the plane $2x+3y+5z+6=0$ is

(a) $2x+3y+5z+27=0$ (b) $2x+3y+5z-27=0$ (c) $2x+y+4z-27=0$ (d) $2x+y+4z+27=0$

159. 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) $x-5y-6z-19=0$

160. The coordinates of the point in which the line joining the points (3, 5, –7) and (–2, 1, 8) is intersected by the plane *yz* are given by

[MP PET 1993]

(a) $\left(0, \frac{13}{5}, 2\right)$ (b) $\left(0, -\frac{13}{5}, -2\right)$ (c) $\left(0, -\frac{13}{5}, \frac{2}{5}\right)$ (d) $\left(0, \frac{13}{5}, \frac{2}{5}\right)$

161. If P be the point (2, 6, 3), then the equation of the plane through P at right angle to OP, O being the origin, is **[MP PET**

(a) $2x+6y+3z=7$ (b) $2x-6y+3z=7$ (c) $2x+6y-3z=49$ (d) $2x+6y+3z=49$

162. The equation of the plane containing the line of intersection of the planes $2x-y=0$ and $y-3z=0$ the perpendicular to the plane $4x+5y-3z-8=0$ is

(a) $28x-17y+9z=0$ (b) $28x+17y+9z=0$ (c) $28x-17y-9z=0$ (d) $7x-3y+z=0$

163. The equation of the plane passing through (1, 1, 1) and (1, –1, –1) and perpendicular to $2x-y+z+5=0$ is**[EAMCET 2003]**

(a) $2x+5y+z-8=0$ (b) $x+y-z-1=0$ (c) $2x+5y+z+4=0$ (d) $x-y+z-1=0$

164. The equation of the plane through the intersection of the planes $x+y+z=1$ and $2x+3y-z+4=0$ and parallel to *x*-axis is

[Orissa JEE 2003]

(a) $y-3z+6=0$ (b) $3y-z+6=0$ (c) $y+3z+6=0$ (d) $3y-2z+6=0$

165. If *O* is the origin and *A* is the point (*a, b, c*), then the equation of the plane through *A* and at right angles to *OA* is

(a) $a(x-a)-b(y-b)-c(z-c)=0$ (b) $a(x+a)+b(y+b)+c(z+c)=0$

(c) $a(x-a)+b(y-b)+c(z-c)=0$ (d) None of these

166. The equation of the plane through the point (1, 2, 3) and parallel to the plane $x+2y+5z=0$ is **[DCE 2002]**

(a) $(x-1)+2(y-2)+5(z-3)=0$ (b) $x+2y+5z=14$

(c) $x+2y+5z=6$ (d) None of these

167. The equation of the plane passing through the intersection of the planes $x+y+z=6$ and $2x+3y+4z+5=0$ and the point (1, 1, 1), is

(a) $20x+23y+26z-69=0$ (b) $20x+23y+26z+69=0$

(c) $23x+20y+26z+69=0$ (d) None of these

168. The equation of the plane passing through the intersection of the planes $x+2y+3z+4=0$ and $4x+3y+2z+1=0$ and the origin is

[Kerala (Engg.) 2002]

(a) $3x+2y+z+1=0$ (b) $3x+2y+z=0$ (c) $2x+3y+z=0$ (d) $x+y+z=0$

169. If the plane $x-2y+3z=0$ is rotated through a right angle about its line of intersection with the plane $2x+3y-4z-5=0$, then the equation of plane in its new position is

(a) $28x-17y+9z=0$ (b) $22x+5y-4z-35=0$ (c) $25x+17y-52z-25=0$ (d) $x+35y-10z-70=0$

170. The equation of the plane passing through the point (–2, –2, 2) and containing the line joining the points (1, 1, 1) and (1, –1, 2) is

(a) $x+2y-3z+4=0$ (b) $3x-4y+1=0$ (c) $5x+2y-3z-17=0$ (d) $x-3y-6z+8=0$

171. The equation of the plane containing the line $2x+z-4=0, 2y+z=0$ and passing through the point (2, 1, –1) is**[AMU 199**

(a) $x+y+z+2=0$ (b) $x+y-z-4=0$ (c) $x-y-z-2=0$ (d) $x+y+z-2=0$

172. In three dimensional space, the equation $3y+4z=0$ represents **[Kurukshetra CEE 1994]**

(a) A plane containing x-axis (b) A plane containing y-axis

(c) A plane containing z-axis (d) A line with direction numbers 0, 3, 4

173. Direction ratios of the normal to the plane passing through the point (2, 1, 3) and the point of intersection of the planes $x+2y+z=3$ and $2x-y-z=5$ are

(a) 13, 6, 1 (b) 5, 7, 3 (c) 4, 3, 2 (d) None of these

174. The plane of intersection of $x^2+y^2+z^2+2x+2y+2z+2=0$ and $4x^2+4y^2+4z^2+4x+4y+4z-1=0$ is **[Pb. CET 1996]**

(a) $4x+4y+4z+9=0$ (b) $x+y+z+9=0$ (c) $4x+4y+4z+1=0$ (d) They do not intersect

175. If the planes $x+2y+kz=0$ and $2x+y-2z=0$ are at right angles, then the value of k is **[MP PET 1999]**

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) -2 (d) 2

176. The value of k for which the planes $3x-6y-2z=7$ and $2x+y-kz=5$ are perpendicular to each other, is **[MP PET 1992]**

(a) 0 (b) 1 (c) 2 (d) 3

177. If the given planes $ax+by+cz+d=0$ and $a'x+b'y+c'z+d'=0$ be mutually perpendicular, then **[MP PET 1994]**

(a) $\frac{a}{a'}=\frac{b}{b'}=\frac{c}{c'}$ (b) $\frac{a}{a'}+\frac{b}{b'}+\frac{c}{c'}=0$ (c) $aa'+bb'+cc'+dd'=0$ (d) $aa'+bb'+cc'=0$

178. The angle between two planes is equal to

(a) The angle between the tangents to them from any point

(b) The angle between the normals to them from any point

(c) The angle between the lines parallel to the planes from any point

(d) None of these

179. If the planes $3x-2y+2z+17=0$ and $4x+3y-kz=25$ are mutually perpendicular, then $k=$ **[MP PET 1995]**

(a) 3 (b) –3 (c) 9 (d) –6

180. The angle between the planes $2x-y+z=6$ and $x+y+2z=7$ is **[MP PET 1991,98,2000,01,03; Rajasthan PET 2001]**

(a) 30° (b) 45° (c) 0° (d) 60°

181. The angle between the planes $3x-4y+5z=0$ and $2x-y-2z=5$ is **[MP PET 1988; Kurukshetra CEE 2000]**

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{6}$ (d) None of these

182. If θ is the angle between the planes $2x-y+2z=3$, $6x-2y+3z=5$, then $\cos\theta$ is equal to **[Kerala (Engg.) 2001]**

(a) $\frac{21}{20}$ (b) $\frac{11}{20}$ (c) $\frac{20}{21}$ (d) $\frac{12}{25}$

183. The value of $aa'+bb'+cc'$ being negative, the origin will lie in the acute angle between the planes $ax+by+cz+d=0$ and $a'x+b'y+c'z+d'=0$, if **[MP PET 2003]**

(a) $a=a'=0$ (b) d and d' are of same sign (c) d and d' are of opposite sign (d)

184. The equation of the plane which bisects the angle between the planes $3x-6y+2z+5=0$ and $4x-12y+3z-3=0$ which contains the origin is

(a) $33x-13y+32z+45=0$ (b) $x-3y+z-5=0$ (c) $33x+13y+32z+45=0$ (d) None of these

185. The equation of the bisector of the obtuse angle between the planes $3x+4y-5z+1=0$, $5x+12y-13z=0$ is

(a) $11x+4y-3z=0$ (b) $14x-8y+13=0$ (c) $x+y+z=9$ (d) $13x-7z+18=0$

186. The two points (1, 1, 1) and (–3, 0, 1) with respect to the plane $3x+4y-12z+13=0$ lie on

(a) Opposite side (b) Same side (c) On the plane (d) None of these

187. Distance between parallel planes $2x-2y+z+3=0$ and $4x-4y+2z+5=0$ is **[MP PET 1994, 95]**

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{6}$ (d) 2

188. The distance between the planes $x+2y+3z+7=0$ and $2x+4y+6z+7=0$ is **[MP PET 1991]**

(a) $\frac{\sqrt{7}}{2\sqrt{2}}$ (b) $\frac{7}{2}$ (c) $\frac{\sqrt{7}}{2}$ (d) $\frac{7}{2\sqrt{2}}$

189. Distance of the point (2, 3, 4) from the plane $3x-6y+2z+11=0$ is **[MP PET 1990,96]**

(a) 1 (b) 2 (c) 3 (d) 0

190. The distance of the plane $6x-3y+2z-14=0$ from the origin is **[MP PET 2003]**

(a) 2 (b) 1 (c) 14 (d) 8

191. The distance of the point (2, 3, –5) from the plane $x+2y-2z=9$ is **[MP PET 2001]**

(a) 4 (b) 3 (c) 2 (d) 1

192. If the points (1, 1, k) and (–3, 0, 1) be equidistant from the plane $3x+4y-12z+13=0$, then $k=$

(a) 0 (b) 1 (c) 2 (d) None of these

193. If the product of distances of the point (1, 1, 1) from the origin and the plane $x-y+z+k=0$ be 5, then $k=$

(a) –2 (b) –3 (c) 4 (d) 7

194. If two planes intersect, then the shortest distance between the planes is **[Kurukshetra CEE 1998]**

(a) $\cos 0^o$ (b) $\cos 90°$ (c) $\sin 90°$ (d) 1

195. The length of the perpendicular from the origin to the plane $3x+4y+12z=52$ is **[MP PET 2000]**

(a) 3 (b) –4 (c) 5 (d) None of these

196. If the length of perpendicular drawn from origin on a plane is 7 units and its direction ratios are $-3, 2, 6,$ then that plane is **[MP PET 1998]**

(a) $-3x+2y+6z-7=0$ (b) $-3x+2y+6z-49=0$ (c) $3x-2y+6z+7=0$ (d) $-3x+2y-6z-49=0$

197. If a plane cuts off intercepts $-6, 3, 4$ from the coordinate axes, then the length of the perpendicular from origin to the plane is

(a) $\frac{1}{\sqrt{61}}$ (b) $\frac{13}{\sqrt{61}}$ (c) $\frac{12}{\sqrt{29}}$ (d) $\frac{5}{\sqrt{41}}$

198. If $A(-1, 2, 3), B(1, 1, 1)$ and $C(2, -1, 3)$ are points on a plane. A unit normal vector to the plane ABC is **[BIT Ranchi 1988]**

(a) $\pm\left(\frac{2\mathbf{i}+2\mathbf{j}+\mathbf{k}}{3}\right)$ (b) $\pm\left(\frac{2\mathbf{i}-2\mathbf{j}+\mathbf{k}}{3}\right)$ (c) $\pm\left(\frac{2\mathbf{i}-2\mathbf{j}-\mathbf{k}}{3}\right)$ (d) $-\left(\frac{2\mathbf{i}+2\mathbf{j}+\mathbf{k}}{3}\right)$

199. If the position vectors of three points A, B and C are respectively $\mathbf{i}+\mathbf{j}+\mathbf{k}, 2\mathbf{i}+3\mathbf{j}-4\mathbf{k}$ and $7\mathbf{i}+4\mathbf{j}+9\mathbf{k}$, then the unit vector to the plane containing the triangle ABC is **[DCE 1999]**

(a) $31\mathbf{i}-18\mathbf{j}-9\mathbf{k}$ (b) $\frac{31\mathbf{i}-38\mathbf{j}-9\mathbf{k}}{\sqrt{2486}}$ (c) $\frac{31\mathbf{i}+18\mathbf{j}+9\mathbf{k}}{\sqrt{2486}}$ (d) None of these

200. The projection of point (a, b, c) in yz plane are

(a) $(0, b, c)$ (b) $(a, 0, c)$ (c) $(a, b, 0)$ (d) $(a, 0, 0)$

Advance Level

201. A variable plane at a constant distance p from origin meets the coordinate axes in A, B, C. Through these points planes are drawn parallel to coordinate planes. Then locus of the point of intersection is

(a) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{p^2}$ (b) $x^2+y^2+z^2=p^2$ (c) $x+y+z=p$ (d) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=p$

202. A variable plane is at a constant distance p from the origin and meets the axes in A, B and C, then the locus of the centroid of the triangle ABC is

(a) $x^{-2}+y^{-2}+z^{-2}=p^{-2}$ (b) $x^{-2}+y^{-2}+z^{-2}=9p^{-2}$ (c) $x^{-2}+y^{-2}+z^{-2}=p^2$ (d) None of these

203. The equation of the plane which bisects line joining (2, 3, 4) and (6, 7, 8) is **[CET 1991, 93]**

(a) $x+y+z-15=0$ (b) $x-y+z-15=0$ (c) $x-y-z-15=0$ (d) $x+y+z+15=0$

204. The equation of the plane which bisects the line joining the points (–1, 2, 3) and (3, –5, 6) at right angle, is

(a) $4x-7y-3z=8$ (b) $4x-7y-3z=28$ (c) $4x-7y+3z=28$ (d) $4x+2y-3z=28$

205. P is a fixed point (a, a, a) on a line through the origin equally inclined to the axes, then any plane through P perpendicular to OP, makes intercepts on the axes, the sum of whose reciprocals is equal to

(a) a (b) $\frac{3}{2a}$ (c) $\frac{3a}{2}$ (d) None of these

206. If from a point $P(a, b, c)$ perpendiculars PA and PB are drawn to yz and zx planes, then the equation of the plane OAB is

(a) $bcx+cay+abz=0$ (b) $bcx+cay-abz=0$ (c) $bcx-cay+abz=0$ (d) $-bcx+cay+abz=0$

207. If l_1, m_1, n_1 and l_2, m_2, n_2 are the direction ratios of two intersecting lines, then the direction ratios of lines through them and coplanar with them are given by

(a) $l_1+km_1, l_2+km_2, l_3+km_3$ (b) $kl_1l_2, km_1m_2, kn_1n_2$

(c) $l_1+kl_2, m_1+km_2, n_1+kn_2$ (d) $\frac{kl_1}{l_2}, \frac{km_1}{m_2}, \frac{kn_1}{n_2}$, k being a number whatsoever

208. The four points (0, 4, 3), (–1, –5, –3), (–2, –2, 1) and (1, 1, –1) lie in the plane

(a) $4x+3y+2z-9=0$ (b) $9x-5y+6z+2=0$ (c) $3x+4y+7z-5=0$ (d) None of these

209. A plane meets the coordinate axes at A, B, C such that the centre 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) $9x+9y+9z=1$

210. Two system of rectangular axes have the same origin. If a plane cuts them at distance a, b, c and a', b', c' from the origin, then **[AIEEE 2003]**

(a) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}=0$ (b) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}+\frac{1}{a'^2}+\frac{1}{b'^2}-\frac{1}{c'^2}=0$

(c) $\frac{1}{a^2}-\frac{1}{b^2}-\frac{1}{c^2}+\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$ (d) $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}-\frac{1}{a'^2}-\frac{1}{b'^2}-\frac{1}{c'^2}=0$

211. Which one of the following is the best condition for the plane $ax+by+cz+d=0$ to intersect the x and y axes at equal angle

(a) $|a|=|b|$ (b) $a=-b$ (c) $a=b$ (d) $a^2+b^2=1$

212. If the equation $2x^2-2y^2+4z^2+6xz+2yz+3xy=0$ represents a pair of planes, then the angle between the pair of planes is

(a) $\cos^{-1}(4/9)$ (b) $\cos^{-1}(4/21)$ (c) $\cos^{-1}(4/17)$ (d) $\cos^{-1}(2/3)$

213. The points $A(-1, 3, 0), B(2, 2, 1)$ and $C(1, 1, 3)$ determine a plane. The distance from the plane to the point $D(5, 7, 8)$ is **[AMU 2001]**

(a) $\sqrt{66}$ (b) $\sqrt{71}$ (c) $\sqrt{73}$ (d) $\sqrt{76}$

214. The length and foot of the perpendicular from the point (7, 14, 5) to the plane $2x+4y-z=2$, are **[AISSE 1987]**

(a) $\sqrt{21}, (1, 2, 8)$ (b) $3\sqrt{21}, (3, 2, 8)$ (c) $21\sqrt{3}, (1, 2, 8)$ (d) $3\sqrt{21}, (1, 2, 8)$

215. The distance of the point (1, 1, 1) from the plane passing through the points (2, 1, 1), (1, 2, 1) and (1, 1, 2) is **[AISSE 198**

(a) $\frac{1}{\sqrt{3}}$ (b) 1 (c) $\sqrt{3}$ (d) None of these

216. Perpendicular is drawn from the point (0, 3, 4) to the plane $2x-2y+z=10$. The coordinates of the foot of the perpendicular are

(a) $(-8/3, 1/3, 16/3)$ (b) $(8/3, 1/3, 16/3)$ (c) $(8/3, -1/3, 16/3)$ (d) $(8/3, 1/3, -16/3)$

217. The equation of the plane containing the lines $\mathbf{r}-\mathbf{a}=t\,\mathbf{b}$ and $\mathbf{r}-\mathbf{b}=s\,\mathbf{a}$ is

(a) $\mathbf{r}.\mathbf{a}=\mathbf{a}.\mathbf{b}$ (b) $[\mathbf{r}\ \mathbf{a}\ \mathbf{b}]=0$ (c) $\mathbf{r}.\mathbf{a}=\mathbf{r}.\mathbf{b}$ (d) $\mathbf{r}.\mathbf{b}=\mathbf{a}.\mathbf{b}$

218. Let the points P, Q and R have position vectors $\mathbf{r}_1=3\mathbf{i}-2\mathbf{j}-\mathbf{k}$; $\mathbf{r}_2=\mathbf{i}+3\mathbf{j}+4\mathbf{k}$ and $\mathbf{r}_3=2\mathbf{i}+\mathbf{j}-2\mathbf{k}$ relative to an origin O. The distance of P from the plane OQR is **[Roorkee 1990]**

(a) 2 (b) 3 (c) 1 (d) 5

219. The projection of the point (1, 3, 4) on the plane $\mathbf{r}.(2\mathbf{i}-\mathbf{j}+\mathbf{k})+3=0$ is

(a) (1, 3, 4) (b) (-3, 5, 2) (c) (-1, 4, 3) (d) None of these

220. If $\mathbf{r}.(2\mathbf{i}-\mathbf{j}+\mathbf{k})+\frac{3}{2}=0$ is the equation of plane and $\mathbf{i}-2\mathbf{j}+3\mathbf{k}$ is a point, then a point equidistant from the plane on the opposite side is **[AMU 1998]**

(a) $\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ (b) $3\mathbf{i}+\mathbf{j}+\mathbf{k}$ (c) $3\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ (d) $3(\mathbf{i}+\mathbf{j}+\mathbf{k})$

221. If (p_1, q_1, r_1) be the image of (p, q, r) in the plane $ax+by+cz+d=0$, then

(a) $\frac{p_1-p}{a}=\frac{q_1-q}{b}=\frac{r_1-r}{c}$ (b) $a(p+p_1)+b(q+q_1)+c(r+r_1)+2d=0$

(c) Both (a) and (b) (d) None of these

Line and Plane

Basic Level

222. The equation of the straight line passing through (1, 2, 3) and perpendicular to the plane $x+2y-5z+9=0$ is **[MP PET 1**

(a) $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{-5}$ (b) $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z+5}{3}$ (c) $\frac{x+1}{1}=\frac{y+2}{2}=\frac{z+3}{-5}$ (d) $\frac{x+1}{1}=\frac{y+2}{2}=\frac{z-5}{3}$

223. The equation of the perpendicular from the point (α, β, γ) to the plane $ax+by+cz+d=0$ is **[MP PET 2003]**

(a) $a(x-\alpha)+b(y-\beta)+c(z-\gamma)=0$ (b) $\frac{x-\alpha}{a}=\frac{y-\beta}{b}=\frac{z-\gamma}{c}$

(c) $a(x-\alpha)+b(y-\beta)+c(z-\gamma)=abc$ (d) None of these

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

(a) $4x-y-2z+6=0$ (b) $4x-y+2z+6=0$ (c) $4x-y-2z-6=0$ (d) None of these

225. The equation of the plane containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$ and the point (0, 7, –7) is **[Roorkee 1999]**

(a) $x+y+z=1$ (b) $x+y+z=2$ (c) $x+y+z=0$ (d) None of these

226. The equation of plane through the line of intersection of planes $ax+by+cz+d=0, a'x+b'y+c'z+d'=0$ and parallel to the line $y=0, z=0$ is **[Kurukshetra CEE 1998]**

(a) $(ab'-a'b)x+(bc'-b'c)y+(ad'-a'd)=0$ (b) $(ab'-a'b)x+(bc'-b'c)y+(ad'-a'd)z=0$

(c) $(ab'-a'b)y+(ac'-a'c)z+(ad'-a'd)=0$ (d) None of these

227. The equation of the plane passing through the line $\frac{x-1}{5}=\frac{y+2}{6}=\frac{z-3}{4}$ and the point (4, 3, 7) is **[MP PET 2001]**

(a) $4x+8y+7z=41$ (b) $4x-8y+7z=41$ (c) $4x-8y-7z=41$ (d) $4x-8y+7z=39$

228. The equation of the plane containing the line $2x-5y+2z=6, 2x+3y-z=5$ and parallel to the line $\frac{x}{1}=\frac{y}{-6}=\frac{z}{7}$ is

(a) $6x+y-10=0$ (b) $6x+y-16=0$ (c) $12x+2y-1=0$ (d) $6x+y+16=0$

229. The equation of the plane which is parallel to the line $\frac{x-4}{1}=\frac{y+3}{-4}=\frac{z+1}{7}$ and passes through the points (0, 0, 0) and (3, –1, 2), is

[DSSE 1984]

(a) $x+19y+11z=0$ (b) $x-19y-11z=0$ (c) $x-19y+11z=0$ (d) None of these

230. Equation of a line passing through (1, –2, 3) and parallel to the plane $2x+3y+z+5=0$ is

(a) $\frac{x-1}{-1}=\frac{y+2}{1}=\frac{z-3}{-1}$ (b) $\frac{x-1}{2}=\frac{y+2}{3}=\frac{z-3}{1}$ (c) $\frac{x+1}{-1}=\frac{y-2}{1}=\frac{z-3}{-1}$ (d) None of these

231. The equation of the plane through the line $3x-4y+5z=10, 2x+2y-3z=4$ and parallel to the line $x=2y=3z$ is

(a) $x-20y+27z=14$ (b) $x+4y+27z=14$ (c) $x-20y+3z=14$ (d) None of these

232. The equation of the plane passing through the line $\frac{x-4}{1}=\frac{y-3}{1}=\frac{z-2}{2}$ and $\frac{x-3}{1}=\frac{y-2}{-4}=\frac{z}{5}$ is

(a) $11x-y-3z=35$ (b) $11x+y-3z=35$ (c) $11x-y+3z=35$ (d) None of these

233. The equation of the plane in which the lines $\frac{x-5}{4}=\frac{y-7}{4}=\frac{z+3}{-5}$ and $\frac{x-8}{7}=\frac{y-4}{1}=\frac{z-5}{3}$ lie, is **[MP PET 2000]**

(a) $17x-47y-24z+172=0$ (b) $17x+47y-24z+172=0$

(c) $17x+47y+24z+172=0$ (d) $17x-47y+24z+172=0$

234. The equation of the line passing through (1, 2, 3) and parallel to the planes $x-y+2z=5$ and $3x+y+z=6$, is**[DSSE 1986**

(a) $\frac{x-1}{-3}=\frac{y-2}{5}=\frac{z-3}{4}$ (b) $\frac{x-1}{-3}=\frac{y-2}{-5}=\frac{z-1}{4}$ (c) $\frac{x-1}{-3}=\frac{y-2}{-5}=\frac{z-1}{-4}$ (d) None of these

235. The plane $x-2y+z-6=0$ and the line $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are related as **[Kurukshetra CEE 2001]**

(a) Parallel to the plane (b) Normal to the plane (c) Lies in the plane (d) None of these

236. The condition that the line $\frac{x-x_1}{l}=\frac{y-y_1}{m}=\frac{z-z_1}{n}$ lies in the plane $ax+by+cz+d=0$ is

(a) $ax_1+by_1+cz_1+d=0$ and $al+bm+cn\neq 0$ (b) $al+bm+cn=0$ and $ax_1+by_1+cz_1+d\neq 0$

(c) $ax_1+by_1+cz_1+d=0$ and $al+bm+cn=0$ (d) $ax_1+by_1+cz_1=0$ and $al+bm+cn=0$

237. $\mathbf{r}=\mathbf{i}+\mathbf{j}+\lambda(2\mathbf{i}+\mathbf{j}+4\mathbf{k})$ and $\mathbf{r}.(\mathbf{i}+2\mathbf{j}-\mathbf{k})=3$ are the equation of line and plane respectively, then which of the following is true

(a) The line is perpendicular to plane (b) The line lies in the plane

(c) The line is parallel to plane but does not lie in plane (d) The line cuts the plane obliquely

238. The line joining the points (3, 5, –7) and (–2, 1, 8) meets the *yz*-plane at point **[Rajasthan PET 2003; MP PET 1993]**

(a) $\left(0,\frac{13}{5},2\right)$ (b) $\left(2,0,\frac{13}{5}\right)$ (c) $\left(0,2,\frac{13}{5}\right)$ (d) (2, 2, 0)

239. Two lines which do not lie in the same plane are called

(a) Parallel (b) Coincident (c) Intersecting (d) Skew

240. The planes $x=cy+bz, y=az+cx, z=bx+ay$ pass through one line, if

(a) $a+b+c=0$ (b) $a+b+c=1$ (c) $a^2+b^2+c^2=1$ (d) $a^2+b^2+c^2+2abc=1$

241. The line $\frac{x-3}{2}=\frac{y-4}{3}=\frac{z-5}{4}$ lies in the plane $4x+4y-kz-d=0$. The values of k and d are

(a) 4, 8 (b) –5, –3 (c) 5, 3 (d) –4, –8

242. If $4x+4y-kz=0$ is the equation of the plane through the origin that contains the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z}{4}$, then $k=$ **[MP PE**

(a) 1 (b) 3 (c) 5 (d) 7

243. If $\frac{x-1}{l}=\frac{y-2}{m}=\frac{z+1}{n}$ is the equation of the line through (1, 2, –1) and (–1, 0, 1); then (*l, m, n*) is **[MP PET 1992]**

(a) (–1, 0, 1) (b) (1, 1, –1) (c) (1, 2, –1) (d) (0, 1, 0)

244. Given the line $L:\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-3}{-1}$ and plane $P:x-2y-z=0$. Then of the following assertions, the only one that is always true is

(a) L is parallel to plane P (b) L is perpendicular to plane P (c) L lies in the plane P

245. The coordinates 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

246. The point where the line $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$ meets the plane $2x + 4y - z = 1$ is **[DSSE 1981]**

(a) (3, –1, 1) (b) (3, 1, 1) (c) (1, 1, 3) (d) (1, 3, 1)

247. The coordinates of the point where the line $\frac{x-6}{-1} = \frac{y+1}{0} = \frac{z+3}{4}$ meets the plane $x + y - z = 3$ are **[MP PET 1998]**

(a) (2, 1, 0) (b) (7, –1, –7) (c) (1, 2, –6) (d) (5, –1, 1)

248. The point of intersection of the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z+2}{3}$ and the plane $2x + 3y + z = 0$ is **[MP PET 1989]**

(a) (0, 1, –2) (b) (1, 2, 3) (c) (–1, 9, –25) (d) $\left(\frac{-1}{11}, \frac{9}{11}, \frac{-25}{11}\right)$

249. If $p_1 = 0$ and $p_2 = 0$ be two non-parallel planes, then the equation $p_1 + \lambda p_2 = 0, \lambda \in R$ represents the family of all planes through the line of intersection of the planes $p_1 = 0$ and $p_2 = 0$, except the plane

(a) $p_1 = 0$ (b) $p_2 = 0$ (c) $p_1 + p_2 = 0$ (d) $p_1 - p_2 = 0$

250. The direction ratios of the normal to the plane passing through the points (1, –2, 3), (–1, 2, –1) and parallel to $\frac{x-2}{2} = \frac{y+1}{3} = \frac{z}{4}$ is

[Tamilnadu (Engg.) 2002]

(a) (2, 3, 4) (b) (4, 0, 7) (c) (–2, 0, –1) (d) (2, 0, –1)

251. The distance between the line $\frac{x-1}{3} = \frac{y+2}{-2} = \frac{z-1}{2}$ and the plane $2x + 2y - z = 6$ is

(a) 9 units (b) 1 unit (c) 2 units (d) 3 units

252. The distance of the point of intersection of the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ and the plane $x + y + z = 17$ from the point (3, 4, 5) is given by

(a) 3 (b) $\frac{3}{2}$ (c) $\sqrt{3}$ (d) None of these

253. 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 **[AI CBSE 1984]**

(a) 1 (b) $\frac{6}{7}$ (c) $\frac{7}{6}$ (d) None of these

254. If line $\frac{x - x_1}{l} = \frac{y - y_1}{m} = \frac{z - z_1}{n}$ is parallel to the plane $ax + by + cz + d = 0$, then **[MNR 1995; MP PET 1995]**

(a) $\frac{a}{l} = \frac{b}{m} = \frac{c}{n}$ (b) $al + bm + cn = 0$ (c) $\frac{a}{l} + \frac{b}{m} + \frac{c}{n} = 0$ (d) None of these

255. The angle between the line $\frac{x-2}{a} = \frac{y-2}{b} = \frac{z-2}{c}$ and the plane $ax + by + cz + 6 = 0$ is

(a) $\sin^{-1}\left(\frac{1}{\sqrt{a^2 + b^2 + c^2}}\right)$ (b) 45° (c) 60° (d) 90°

256. The angle between the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$ and the plane $3x + 2y - 3z = 4$ is **[MP PET 2003]**

(a) 45° (b) 0° (c) $\cos^{-1}\left(\frac{24}{\sqrt{29}\sqrt{22}}\right)$ (d) 90°

257. The angle between the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z+3}{-2}$ and the plane $x + y + 4 = 0$, is **[MP PET 1999]**

(a) 0° (b) 30° (c) 45° (d) 90°

258. 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 **[AI CBSE 1981; Pb. CET 1997]**

(a) $\sin^{-1}\left(\frac{4}{\sqrt{406}}\right)$ (b) $\sin^{-1}\left(\frac{-4}{\sqrt{406}}\right)$ (c) $\sin^{-1}\left(\frac{4}{14\sqrt{29}}\right)$ (d) None of these

Advance Level

259. A straight line passes through the point (2, –1, –1). It is parallel to the plane $4x + y + z + 2 = 0$ and is perpendicular to the line $x/1 = y/(-2) = (z-5)/1$. The equation of the straight line are

(a) $(x-2)/4 = (y+1)/1 = (z+1)/1$ (b) $(x+2)/4 = (y-1)/1 = (z-1)/3$

(c) $(x-2)/(-1) = (y+1)/1 = (z+1)/3$ (d) $(x+2)/(-1) = (y-1)/1 = (z-1)/3$

260. The equations of the projection of the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{3}$ on the plane $x + y + z - 1 = 0$ are

(a) $x + y + z - 1 = 0 = 2x - y - z + 3$ (b) $x + y - z - 1 = 0 = x + 2y - z - 3$

(c) $2x - y + 3z - 1 = 0 = x + y + z + 1$ (d) $x + 2y - 3z = 0 = x + y + z + 1$

261. If a plane passes through the point (1, 1, 1) and is perpendicular to the line $\frac{x-1}{3} = \frac{y-1}{0} = \frac{z-1}{4}$, then its perpendicular distance from the origin is **[MP PET 1998]**

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{7}{5}$ (d) 1

262. The line $\frac{x-2}{3}=\frac{y+1}{2}=\frac{z-1}{-1}$ intersects the curve $xy=c^2, z=0$ if $c=$

(a) ± 1 (b) $\pm 1/3$ (c) $\pm\sqrt{5}$ (d) None of these

263. The points on the line $\frac{x+1}{1}=\frac{y+3}{3}=\frac{z-2}{-2}$ distant $\sqrt{(14)}$ from the point in which the line meets the plane $3x+4y+5z-5=0$ are

(a) (0, 0, 0), (2, –4, 6) (b) (0, 0, 0), (3, –4, –5) (c) (0, 0, 0), (2, 6, –4) (d) (2, 6, –4), (3, –4, –5)

264. The angle between the line $\mathbf{r}=(\mathbf{i}+2\mathbf{j}-\mathbf{k})+\lambda(\mathbf{i}-\mathbf{j}+\mathbf{k})$ and the normal to the plane $\mathbf{r}.(2\mathbf{i}-\mathbf{j}+\mathbf{k})=4$ is **[MP PET 1997]**

(a) $\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (b) $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (c) $\tan^{-1}\left(\frac{2\sqrt{2}}{3}\right)$ (d) $\cot^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

265. Angle between the line $\mathbf{r}=(2\mathbf{i}-\mathbf{j}+\mathbf{k})+\lambda(-\mathbf{i}+\mathbf{j}+\mathbf{k})$ and the plane $\mathbf{r}.(3\mathbf{i}+2\mathbf{j}-\mathbf{k})=4$ is **[AMU 1993]**

(a) $\cos^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (b) $\cos^{-1}\left(-\frac{2}{\sqrt{42}}\right)$ (c) $\sin^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (d) $\sin^{-1}\left(-\frac{2}{\sqrt{42}}\right)$

Sphere

Basic Level

266. The ratio in which the sphere $x^2+y^2+z^2=504$ divides the line segment AB joining the points $A(12,-4,8)$ and $(27,-9,18)$ is given by

(a) $2:3$ externally (b) $2:3$ internally (c) $1:2$ externally (d) None of these

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

(a) x-axis (b) z-axis (c) y-axis (d) yz-plane

268. A point moves so that the sum of the squares of its distances from two given points remains constant. The locus of the point is

(a) A line (b) A plane (c) A sphere (d) None of these

269. The locus of the equation $x^2+y^2+z^2+1=0$ is

(a) An empty set (b) A sphere (c) A degenerate set (d) A pair of planes

270. Let (3, 4, –1) and (–1, 2, 3) are the end points of a diameter of sphere. Then the radius of the sphere is equal to **[Orissa JEE 2003]**

(a) 1 (b) 2 (c) 3 (d) 9

271. The number of spheres of radius 'a' touching all the coordinate planes is

(a) 4 (b) 8 (c) 1 (d) None of these

272. The equation of the sphere touching the three coordinate planes is **[AMU 2002]**

(a) $x^2+y^2+z^2+2a(x+y+z)+2a^2=0$ (b) $x^2+y^2+z^2-2a(x+y+z)+2a^2=0$

(c) $x^2+y^2+z^2\pm 2a(x+y+z)+2a^2=0$ (d) $x^2+y^2+z^2\pm 2ax\pm 2ay\pm 2az+2a^2=0$

273. Equation $ax^2+by^2+cz^2+2fyz+2gzx+2hxy+2ux+2vy+2wz+d=0$ represent, a sphere, if **[MP PET 1990]**

(a) $a=b=c$ (b) $f=g=h=0$

(c) $v=u=w$ (d) $a=b=c$ and $f=g=h=0$

274. The centre of the sphere which passes through (a, 0, 0), (0, b, 0), (0, 0, 0) is **[AMU 1990]**

(a) $\left(\frac{a}{2},0,0\right)$ (b) $\left(0,\frac{b}{2},0\right)$ (c) $\left(0,0,\frac{c}{2}\right)$ (d) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$

275. The equation $ax^2+ay^2+az^2+2ux+2vy+2wz+d=0,\ a\neq 0,$ represents a sphere if

(a) $u^2+v^2+w^2+ad\leq 0$ (b) $u^2+v^2+w^2+ad\geq 0$ (c) $u^2+v^2+w^2-ad\leq 0$ (d) $u^2+v^2+w^2-ad\geq 0$

276. The radius of the sphere $x^2+y^2+z^2-6x+8y-10z+1=0$ is **[Kurukshetra CEE 1994]**

(a) 7 (b) 5 (c) 2 (d) 15

277. Centre of the sphere $(x-x_1)(x-x_2)+(y-y_1)(y-y_2)+(z-z_1)(z-z_2)=0$ is

(a) (x_2,y_2,z_2) (b) $\left(\frac{x_1-x_2}{2},\frac{y_1-y_2}{2},\frac{z_1-z_2}{2}\right)$ (c) $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2},\frac{z_1+z_2}{2}\right)$ (d) (x_1,y_1,z_1)

278. The equation of the tangent plane at a point (x_1,y_1,z_1) on the sphere $x^2+y^2+z^2+2ux+2vy+2wz+d=0$ is

(a) $xx_1+yy_1+zz_1+ux+vy+wz+d=0$ (b) $xx_1+yy_1+zz_1+ux_1+vy_1+wz_1+d=0$

(c) $xx_1+yy_1+zz_1+u(x+x_1)+v(y+y_1)+w(z+z_1)+d=0$ (d) None of these

279. If two spheres of radii r_1 and r_2 cut orthogonally, then the radius of the common circle is

(a) r_1r_2 (b) $\sqrt{(r_1^2+r_2^2)}$ (c) $r_1r_2\sqrt{(r_1^2+r_2^2)}$ (d) $\frac{r_1r_2}{\sqrt{(r_1^2+r_2^2)}}$

280. The equation of the sphere, concentric with the sphere $x^2+y^2+z^2-4x-6y-8z-5=0$ and which passes through (0, 1, 0), is **[Pb. CET 1994]**

(a) $x^2+y^2+z^2-4x-6y-8z+1=0$ (b) $x^2+y^2+z^2-4x-6y-8z+5=0$

(c) $x^2+y^2+z^2-4x-6y-5z+2=0$ (d) $x^2+y^2+z^2-4x-6y-5z+3=0$

281. The radius of the sphere which passes through the points (0, 0, 0), (1, 0, 0), (0, 1, 0) and (0, 0, 1) is **[AMU 1991]**

(a) $\frac{1}{2}$ (b) 1 (c) $\sqrt{3}$ (d) $\sqrt{3}/2$

282. The coordinates of the centre of the sphere $(x+1)(x+3)+(y-2)(y-4)+(z+1)(z+3)=0$ are **[AMU 1987]**

(a) (1, –1, 1) (b) (–1, 1, –1) (c) (2, –3, 2) (d) (–2, 3, –2)

283. Equation of the sphere with centre (1, –1, 1) and radius equal to that of sphere $2x^2+2y^2+2z^2-2x+4y-6z=1$ is **[DCE 1994]**

(a) $x^2+y^2+z^2+2x-2y+2z+1=0$ (b) $x^2+y^2+z^2-2x+2y-2z-1=0$

(c) $x^2+y^2+z^2-2x+2y-2z+1=0$ (d) None of these

284. The equation of the sphere concentric with the sphere $x^2+y^2+z^2-2x-6y-8z-5=0$ and which passes through the origin is **[Pb. CET 1990]**

(a) $x^2+y^2+z^2-2x-6y-8z=0$ (b) $x^2+y^2+z^2-6y-8z=0$

(c) $x^2+y^2+z^2=0$ (d) None of these

285. The equation of the sphere with centre at (2, 3, –4) and touching the plane $2x+6y-3z+15=0$ is

(a) $x^2+y^2+z^2-4x-6y+8z-20=0$ (b) $x^2+y^2+z^2+4x-6y-8z-20=0$

(c) $x^2+y^2+z^2-4x-6y+8z+20=0$ (d) None of these

286. Spheres $x^2+y^2+z^2+x+y+z-1=0$ and $x^2+y^2+z^2+x+y+z-5=0$ **[AMU 1991]**

(a) Intersect in a plane (b) Intersect in five points (c) Do not intersect (d) None of these

287. If **r** be position vector of any point on a sphere and **a** and **b** are respectively position vectors of the extremities of a diameter, then **[AMU 1999]**

(a) $\mathbf{r}\cdot(\mathbf{a}-\mathbf{b})=0$ (b) $\mathbf{r}\cdot(\mathbf{r}-\mathbf{a})=0$ (c) $(\mathbf{r}+\mathbf{a})\cdot(\mathbf{r}+\mathbf{b})=0$ (d) $(\mathbf{r}-\mathbf{a})\cdot(\mathbf{r}-\mathbf{b})=0$

288. The centre of the sphere $\alpha\,\mathbf{r}-2\mathbf{u}\,.\,\mathbf{r}=\beta,(\alpha\neq 0)$ is **[AMU 1999]**

(a) $-\mathbf{u}/\alpha$ (b) $\mathbf{u}/\alpha$ (c) $\alpha\,\mathbf{u}/\beta$ (d) $\frac{\alpha+\beta}{\alpha}\mathbf{u}$

289. The spheres $\mathbf{r}^2+2\mathbf{u}_1.\,\mathbf{r}+2\mathbf{d}_1=0$ and $\mathbf{r}^2+2\mathbf{u}_2.\,\mathbf{r}+2\mathbf{d}_2=0$ cut orthogonally, if **[AMU 1999]**

(a) $\mathbf{u_1}\cdot\mathbf{u_2}=\mathbf{0}$ (b) $\mathbf{u_1}+\mathbf{u_2}=\mathbf{0}$

(c) $\mathbf{u_1}\cdot\mathbf{u_2}=\mathbf{d_1}+\mathbf{d_2}$ (d) $(\mathbf{u_1}-\mathbf{u_2})\cdot(\mathbf{u_1}+\mathbf{u_2})=\mathbf{d_1^2}+\mathbf{d_2^2}$

Advance level

290. If a sphere of constant radius *k* passes through the origin and meets the axis in *A, B, C* then the centroid of the triangle *ABC* lies on

(a) $x^2+y^2+z^2=k^2$ (b) $x^2+y^2+z^2=4k^2$ (c) $9(x^2+y^2+z^2)=4k^2$ (d) $9(x^2+y^2+z^2)=k^2$

291. The smallest radius of the sphere passing through (1, 0, 0), (0, 1, 0) and (0, 0, 1) is **[Pb. CET 1997,99; Kurukshetra CEE 1996]**

(a) $\sqrt{\frac{3}{5}}$ (b) $\sqrt{\frac{3}{8}}$ (c) $\sqrt{\frac{2}{3}}$ (d) $\sqrt{\frac{5}{12}}$

292. In order that bigger sphere (centre C_1, radius *R*) may fully contain a smaller sphere (center C_2, radius *r*), the correct relationship is **[AMU 1991]**

(a) $C_1C_2<r+R$ (b) $C_1C_2<R-r$ (c) $C_1C_2<2(R-r)$ (d) $C_1C_2<\frac{1}{2}(R+r)$

293. A sphere $x^2+y^2+z^2=9$ is cut by the plane $x+y+z=3$. The radius of the circle so formed is

(a) $\sqrt{6}$ (b) $\sqrt{3}$ (c) 3 (d) 6

294. The radius of the circle $x^2+y^2+z^2-2y-4z=11,\ x+2y+2z=15$ is **[AMU 1990,92]**

(a) 4 (b) $\sqrt{7}$ (c) 5 (d) 7

295. The line $\frac{x+1}{-1}=\frac{y-12}{5}=\frac{z-7}{2}$ cuts the surface $11x^2-5y^2+z^2=0$ in the point

(a) (1, 1, 1) and (1, 2, 3) (b) (1, –1, 2) and (1, 2, 4) (c) (1, 2, 3) and (2, –3, 1) (d) None of these

296. The equation of the sphere circumscribing the tetrahedron whose faces are $x=0, y=0, z=0$ and $x/a+y/b+z/c=1$ is

(a) $x^2+y^2+z^2=a^2+b^2+c^2$

(b) $x^2+y^2+z^2-ax-by-cz=0$

(c) $x^2+y^2+z^2-2ax-2by-2cz=0$

(d) None of these

297. A plane passes through a fixed point (*a, b, c*). The locus of the foot of the perpendicular drawn to it from the origin is

(a) $x^2 + y^2 + z^2 + ax + by + cz = 0$ (b) $x^2 + y^2 + z^2 - ax - by - cz = 0$

(c) $x^2 + y^2 + z^2 + 2ax + 2by + 2cz = 0$ (d) $x^2 + y^2 + z^2 + 2ax - 2by - 2cz = 0$

298. The equation of the sphere passing through the point (1, 3, –2) and the circle $y^2 + z^2 = 25$ and $x = 0$ is **[DCE 1998]**

(a) $x^2 + y^2 + z^2 + 11x + 25 = 0$ (b) $x^2 + y^2 + z^2 - 11x + 25 = 0$

(c) $x^2 + y^2 + z^2 + 11x - 25 = 0$ (d) $x^2 + y^2 + z^2 - 11x - 25 = 0$

299. Radius of the circle $\mathbf{r}^2 + \mathbf{r} \cdot (2\mathbf{i} - 2\mathbf{j} - 4\mathbf{k}) - 19 = 0$, $\mathbf{r}.(\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}) + 8 = 0$ is **[Kurukshetra CEE 1996, DCE 1997]**

(a) 2 (b) 3 (c) 4 (d) 5

300. The shortest distance from the point (1, 2, –1) to the surface of the sphere $x^2 + y^2 + z^2 = 24$ is **[Pb. CET 1996]**

(a) $3\sqrt{6}$ (b) $2\sqrt{6}$ (c) $\sqrt{6}$ (d) 2

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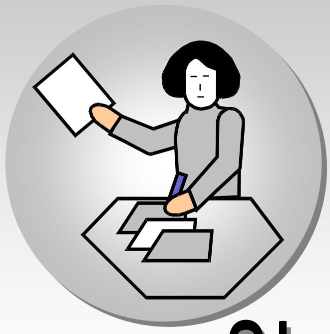

Answer Sheet

Three Dimensional Co-ordinate Geometry — *Assignment (Basic and Advance*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	c	a	c	b	b	d	b	a	b	d	a	c	d	c	b	c	b	d	a
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
b	c	a	b	d	c	b	a	b	b	a	d	c	a	a	d	a	b	d	d
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
a	b	d	a	b	a	b	c	b	a	d	a	a	d	c	a	a	b	d	d
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
d	b	b	c	c	a	b	b	d	a	a	b	b	a	b	a	b	d	d	c
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
b	b	a	c	a	d	a	a	d	c	a	b	d	d	a	d	d	d	a	a
101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
b	c	c	c	a	d	b	b	c	c	a	b	a	c	c	a	c	c	b	b
121	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**
b	d	c	b	c	d	c	d	d	a	c	c	d	c	a	c	b	b	a	c
141	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**
a	c	b	c	d	b	b	b	a	a	d	d	a	a	d	d	a	b	a	a
161	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**177**	**178**	**179**	**180**
d	a	b	a	c	a	a	b	b	d	d	a	a	a	d	a	d	b	a	d
181	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**	**197**	**198**	**199**	**200**
b	c	b	d	b	a	c	a	a	a	b	b	c	b	d	b	c	a	b	a
201	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**	**217**	**218**	**219**	**220**
a	b	a	c	d	b	c	b	b	d	a	a	a	d	a	b	b	b	c	b
221	**222**	**223**	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**	**232**	**233**	**234**	**235**	**236**	**237**	**238**	**239**	**240**
c	a	b	d	c	c	b	b	b	a	a	d	a	a	a	c	b	a	d	d
241	**242**	**243**	**244**	**245**	**246**	**247**	**248**	**249**	**250**	**251**	**252**	**253**	**254**	**255**	**256**	**257**	**258**	**259**	**260**
c	c	b	c	c	a	d	d	b	d	d	a	a	b	d	b	c	b	c	a
261	**262**	**263**	**264**	**265**	**266**	**267**	**268**	**269**	**270**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**278**	**279**	**280**
c	c	c	a	d	a	a	c	a	c	b	d	d	d	d	a	c	c	d	b
281	**282**	**283**	**284**	**285**	**286**	**287**	**288**	**289**	**290**	**291**	**292**	**293**	**294**	**295**	**296**	**297**	**298**	**299**	**300**

d	d	b	a	a	c	d	d	c	c	c	b	a	b	c	b	b	c	c	c