Multiple Choice Questions. Unit IV .

1. The condition for tangency of plane $lx + my + nz = p$ to conicoid $ax^2 + by^2 + cz^2 = 1$ is

   A. $\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c} = 0$

   B. $\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c} = p^2$

   C. $\frac{l}{a} + \frac{m}{b} + \frac{n}{c} = p$

   D. $al^2 + bm^2 + cn^2 = p^2$

2. The point of contact of the tangent plane $lx + my + nz = p$ to conicoid $ax^2 + by^2 + cz^2 = 1$ is

   A. $(\frac{l^2}{ap}, \frac{m^2}{bp}, \frac{n^2}{cp})$

   B. $(\frac{al}{p}, \frac{bm}{p}, \frac{cn}{p})$

   C. $(\frac{lp}{a}, \frac{bm}{b}, \frac{pn}{c})$

   D. $(\frac{l}{ap}, \frac{m}{bp}, \frac{n}{cp})$

3. The director sphere of the conicoid $ax^2 + by^2 + cz^2 = 1$ is

   A. $x^2 + y^2 + z^2 = \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$

   B. $x^2 + y^2 + z^2 = a + b + c$

   C. $x^2 + y^2 + z^2 = \frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca}$

   D. $x^2 + y^2 + z^2 = ab + bc + ca$

4. The equation of the tangent plane to the conicoid $x^2-2y^2+3z^2 = 2$ at the point $(1, 1, 1)$ is

   A. $x - 2y + 3z = 0$

   B. $x + 2y + 3z = 2$

C. $x - 2y + 3z = 2$

D. $2x - 4y + 6z = 2$

5. The plane $lx+my+nz = \sqrt{\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c}}$ always touches the conicoid

A. $ax^2 + by^2 + cz^2 = 1$

B. $x^2 + y^2 + z^2 = a + b + c$

C. $x^2 + y^2 + z^2 = a^2 + b^2 + c^2$

D. $ax^2 + by^2 + cz^2 = ab + bc + ca$

6. Number of normal planes from any point to conicoid $ax^2 + by^2 + cz^2 = 1$ is

A. 3

B. 5

C. 6

D. None of these

7. The equation of tangent plane at the point $(1, 2, 3)$ to conicoid $3x^2 + 4y^2 - 2y^2 = 1$ is

A. $3x + 8y - 6z = 1$

B. $3x + 8y - 6z = 0$

C. $x + 4y - 3z = 1$

D. $x + 3y - 2z = 1$

8. The point of contact of the tangent plane $2x + 3y + 5z = 17$ to conicoid $2x^2 + 6y^2 + 5z^2 = 34$ is

A. $(1, 2, 2)$

B. $(2, 2, 1)$

C. $(2, 1, 2)$

D. None of these

9. The equation of normal at the point (α, β, γ) to conicoid $ax^2 + by^2 + cz^2 = 1$ is

   A. $\frac{x-\alpha}{a} = \frac{y-\beta}{b} = \frac{z-\gamma}{c}$

   B. $\frac{x-\alpha}{a\alpha} = \frac{y-\beta}{b\beta} = \frac{z-\gamma}{c\gamma}$

   C. $\frac{x-\alpha}{a^2} = \frac{y-\beta}{b^2} = \frac{z-\gamma}{c^2}$

   D. None of these

10. The equation of tangent planes to the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ and parallel to the plane $lx + my + nz = 0$ are

    A. $lx + my + nz = \pm(al + bm + cn)$

    B. $lx + my + nz = \pm(\sqrt{al + bm + cn})$

    C. $lx + my + nz = \pm(a^2l^2 + b^2m^2 + c^2n^2)$

    D. $lx + my + nz = \pm(\sqrt{a^2l^2 + b^2m^2 + c^2n^2})$

11. The pole of the plane $lx+my+nz = p$ with respect to the conicoid $ax^2 + by^2 + cz^2 = 1$ is

    A. $(\frac{al}{p}, \frac{bm}{p}, \frac{cn}{p})$

    B. $(\frac{l^2}{ap}, \frac{m^2}{bp}, \frac{n^2}{cp})$

    C. $(\frac{l}{ap}, \frac{m}{bp}, \frac{n}{cp})$

    D. $(\frac{a}{lp}, \frac{b}{np}, \frac{c}{np})$

12. The polar plane of the polar point (α, β, γ) to conicoid $ax^2 + by^2 + cz^2 = 1$ is

    A. $a\alpha x + b\beta y + c\gamma z = 1$

B. $ax + by + cz = 1$

C. $a\alpha x + b\beta y + c\gamma z = 0$

D. $a\alpha x^2 + b\beta y^2 + c\gamma z^2 = 1$

13. The plane $x + 2y - 3z = 6$ touches the conicoid $x^2 + 2y^2 + 3z^2 = 6$ at the point

A. $(2, 1, -3)$

B. $(1, 1, -1)$

C. $(1, -2, 1)$

D. $(2, 1, -2)$

14. The centre of the director sphere of the central conicoid $3x^2 + 4y^2 - 5z^2 = 1$ is

A. $(1, 0, 0)$

B. $(0, 1, 0)$

C. $(0, 0, 0)$

D. $(0, 0, 1)$

15. The radius of the director sphere of the ellipsoid $\frac{x^2}{6} + \frac{y^2}{4} + \frac{z^2}{15} = 1$ is

A. 4

B. 1

C. 3

D. 5

16. The length of the perpendicular drawn from the centre of the conicoid $x^2 - y^2 + z^2 = 1$ to the tangent plane to it at the point $(1, 1, 1)$ is

A. $\frac{1}{3}$

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. None of these

17. A central conicoid $ax^2+by^2+cz^2 = 1$ is an ellipsoid if the constants are

A. $+a, +b, +c$

B. $-a, +b, +c$

C. $-a, -b, +c$

D. $+a, -b, -c$

18. A conicoid $ax^2 + by^2 = 2cz$ represents a hyperbolic paraboloid if a and b are

A. $+a, -b$

B. $+a, +b$

C. $-a, -b$

D. None of these

19. The equation of tangent plane at the point (x_1, y_1, z_1) to the paraboloid $ax^2 + by^2 = 2cz$ is

A. $ax_1x + by_1y + cz_1 = 0)$

B. $ax_1x + by_1y = c(z + z_1)$

C. $ax_1x + by_1y = c$

D. $ax_1x + by_1y = cz$

20. The condition that the plane $lx+my+nz = p$ touches the paraboloid $ax^2 + by^2 = 2cz$ is

A. $\frac{l}{a} + \frac{m}{b} + \frac{n}{c} = 0$

B. $\frac{l^2}{a} + \frac{m^2}{b} = -\frac{2nl}{c}$

C. $\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c} = 0$

D. None of these

21. Number of normals can be drawn from a point (x_1, y_1, z_1) to the paraboloid $ax^2 + by^2 = 2cz$ is

A. 1

B. 3

C. 5

D. None of these

22. The equation of tangent plane to the paraboloid $\frac{x^2}{2} - \frac{y^2}{3} = z$ at the point $(8, 9, 5)$ is

A. $8x - 6y = z$

B. $8x - 6y + 5z + 5 = 0$

C. $8x - 6y - z - 5 = 0$

D. $8x + 6y - z + 5 = 0$

23. The equation of normals to the paraboloid $ax^2 + by^2 = 2cz$ at point (x_1, y_1, z_1) are

A. $\frac{x-x_1}{bx_1} = \frac{y-y_1}{cy_1} = \frac{z-z_1}{az_1}$

B. $\frac{x-x_1}{ax_1} = \frac{y-y_1}{by_1} = \frac{z-z_1}{cz_1}$

C. $\frac{x-x_1}{ax_1} = \frac{y-y_1}{by_1} = \frac{z-z_1}{-c}$

D. None of these

24. The equation $\frac{x^2}{4} + \frac{y^2}{6} = -3z$ represents

A. Elliptic paraboloid

B. hyperbolic paraboloid

C. Ellipsoid

D. None of these

25. The equation of enveloping cylinder of the paraboloid $ax^2 + by^2 = 2cz$, whose generators are parallel to the line $\frac{x}{l} + \frac{y}{m} + \frac{z}{n}$ is

A. $(alx + bmy - cnz)^2 = (al^2 + bm^2)(ax^2 + by^2 - 2cz)$

B. $(alx + bmy - cn)^2(al^2 + bm^2) = (ax^2 + by^2 - 2cz)$

C. $(alx + bmy - cn)^2 = (al^2 + bm^2)(ax^2 + by^2 - 2cz)$

D. $(alx + bmy - cn)^2 = (al^2 + bm^2 + cn^2)(ax^2 + by^2 - 2cz)$

26. The equation of polar plane with polar point (x_1, y_1, z_1) to paraboloid $ax^2 + by^2 = 2cz$ is

A. $ax_1x + by_1y = cz$

B. $ax_1x + by_1y = c(z + z_1)$

C. $ax_1x + by_1y = cz_1$

D. $ax_1x + by_1y + (z + z_1) = 0$

27. If the planes $l_1x + m_1y + n_1 = 0$, $l_2x + m_2y + n_2 = 0$ are conjugate diametral planes of the paraboloid $ax^2 + by^2 = 2cz$, then

A. $\frac{l_1l_2}{b} + \frac{m_1m_2}{a} = 0$

B. $\frac{l_1l_2}{a^2} + \frac{m_1m_2}{b^2} = 0$

C. $\frac{l_1l_2}{a} + \frac{m_1m_2}{b} = 0$

D. $al_1l_2 + bm_1m_2 = 0$

28. The point of contact of tangent plane $x + 2y - 2z = 4$ to the paraboloid $3x^2 + 4y^2 = 24z$ is

A. $(2, 3, 2)$

B. $(2, 2, 2)$

C. $(3, 2, 2)$

D. None of these

29. The equation of confocal conicoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ is

A. $\frac{x^2}{a+\lambda} + \frac{y^2}{b+\lambda} + \frac{z^2}{c+\lambda} = 1$

B. $\frac{x^2}{a^2-\lambda} + \frac{y^2}{b^2-\lambda} + \frac{z^2}{c^2-\lambda} = 1$

C. $\frac{x^2}{a-\lambda} + \frac{y^2}{b-\lambda} + \frac{z^2}{c-\lambda} = 1$

D. None of these

30. Number of conicoid confocals passing through the point (α, β, γ) to conicoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ is

A. 5

B. 3

C. 4

D. None of these

31. If $lx + my + nz = p$ is tangent plane to the confocal conicoid $\frac{x^2}{a^2-\lambda} + \frac{y^2}{b^2-\lambda} + \frac{z^2}{c^2-\lambda} = 1$, then

A. $\frac{1}{p^2} = \frac{(a^2-\lambda)}{l^2} + \frac{(b^2-\lambda)}{m^2} + \frac{(c^2-\lambda)}{n^2}$

B. $p = l(a^2 - \lambda) + m(b^2 - \lambda) + n(c^2 - \lambda)$

C. $p^2 = l^2(a^2 + \lambda) + m^2(b^2 + \lambda) + n^2(c^2 + \lambda)$

D. $p^2 = l^2(a^2 - \lambda) + m^2(b^2 - \lambda) + n^2(c^2 - \lambda)$

32. The nature of plane section of the central conicoid $ax^2+by^2+cz^2 = 1$ by $lx + my + nz = p$, is an ellipse if

A. $bcl^2 + cam^2 + abn^2 < 0$

B. $bcl^2 + cam^2 + abn^2 = 0$

C. $bcl^2 + cam^2 + abn^2 > 0$

D. None of these

33. The nature of plane section of the central conicoid $ax^2+by^2+cz^2 = 1$ by $lx + my + nz = p$ is a hyperbola if

A. $bcl^2 + cam^2 + abn^2 < 0$

B. $bcl^2 + cam^2 + abn^2 > 0$

C. $bcl^2 + cam^2 + abn^2 = 0$

D. None of these

34. The nature of plane section of the central conicoid $ax^2+by^2+cz^2 = 1$ by $lx + my + nz = p$ is a parabola if

A. $bcl^2 + cam^2 + abn^2 > 0$

B. $bcl^2 + cam^2 + abn^2 = 0$

C. $bcl^2 + cam^2 + abn^2 < 0$

D. None of these

35. The length of perpendicular from the origin to the tangent plane $lx+my+nz = \sqrt{(\frac{l^2}{a} + \frac{m^2}{b} + \frac{n^2}{c})}$ parallel to the plane section $ax^2 + by^2 + cz^2 = 1$, $lx + my + nz = 0$ is

A. $p = \frac{\sqrt{bcl+cam+abn}}{\sqrt{(abc)}\sqrt{(l^2+m^2+n^2)}}$

B. $p = \frac{\sqrt{bcl^2+cam^2+abn^2}}{\sqrt{(abc)}}$

C. $p = \frac{\sqrt{bcl^2+cam^2+abn^2}}{\sqrt{(abc)}\sqrt{(l^2+m^2+n^2)}}$

D. $p = \frac{\sqrt{bcl^2+cam^2+abn^2}}{\sqrt{(l^2+m^2+n^2)}}$

36. The area of the section of central conicoid $ax^2 + by^2 + cz^2 = 1$, $lx + my + nz = 0$ is

A. $A = \frac{\sqrt{l^2+m^2+n^2}}{\pi\sqrt{bcl^2+cam^2+abn^2}}$

B. $A = \frac{\pi\sqrt{l^2+m^2+n^2}}{\sqrt{bcl^2+cam^2+abn^2}}$

C. $A = \frac{\sqrt{l^2+m^2+n^2}}{\sqrt{bcl^2+cam^2+abn^2}}$

D. $A = \frac{\pi^2\sqrt{l^2+m^2+n^2}}{\sqrt{bcl^2+cam^2+abn^2}}$

37. The section of central conicoid $ax^2+by^2+cz^2 = 1$, $lx+my+nz = 0$ is rectangular hyperbola if

A. $(b+c)l^2 + (c+a)m^2 + (a+b)n^2 = 0$

B. $bcl^2 + cam^2 + abn^2 = 0$

C. $bc + ca + ab = l^2 + m^2 + n^2$

D. None of these

38. The length of semi-axes of section of ellipsoid $9x^2+6y^2+14z^2 = 3$, $x + y + z = 0$ are

A. $\sqrt{22}, 2$

B. $3, 2$

C. $\frac{3}{22}, \frac{1}{2}$

D. $\frac{3}{\sqrt{22}}, \frac{1}{2}$

39. The co-ordinate of the centre of the section of the ellipsoid $3x^2 + 3y^2 + 6z^2 = 10, x + y + z = 1$ is

A. $(\frac{2}{5}, \frac{2}{5}, \frac{1}{5})$

B. $(\frac{1}{5}, \frac{1}{5}, \frac{2}{5})$

C. $(\frac{1}{5}, \frac{2}{5}, \frac{2}{5})$

D. None of these

40. If A_1, A_2, A_3 are the areas of three mutually perpendicular sections of an ellipsoid, then

A. $\frac{1}{A_1^2} + \frac{1}{A_2^2} + \frac{1}{A_3^2} = constant$

B. $A_1^2 + A_2^2 + A_3^2 = constant$

C. $\frac{1}{A_1} + \frac{1}{A_2} + \frac{1}{A_3} = constant$

D. None of these

41. The real circular sections of the surface $4x^2+2y^2+z^2+3yz+zx = 1$ are

A. $2x + y + 3z = 0, x - y + 5z = 0$

B. $x - y + z = 0, x + y - 2z = 0$

C. $x + y - z = 0, x - y + 2z = 0$

D. $x + y - z = 1, x - y + 2z = 3$

42. The equation of the generating line of the hyperboloid $yz + 2zx + 3xy + 6 = 0$ which passes through the point $(-1, 0, 3)$ is

A. $\frac{x+1}{1} = \frac{y}{-1} = \frac{z-3}{3}$

B. $\frac{x-1}{2} = \frac{y}{-2} = \frac{z+3}{3}$

C. $\frac{x-1}{1} = \frac{y}{1} = \frac{z-3}{2}$

D. $\frac{x-1}{1} = \frac{y}{2} = \frac{z+1}{1}$

43. The centre of the conicoid $3x^2-y^2-z^2+6yz-6x+6y-2z-2 = 0$ is

A. $(-1, 0, 1)$

B. $(1, 0, -1)$

C. $(1, 2, -1)$

D. None of these

Answer Key: Unit IV.

1. B
2. D
3. A
4. C
5. A
6. C
7. A
8. C
9. B
10. D
11. C
12. A
13. B
14. C
15. D
16. B
17. A
18. A

19. B
20. B
21. C
22. C
23. C
24. A
25. C
26. B
27. C
28. A
29. B
30. B
31. D
32. A
33. B
34. B
35. C
36. B
37. A

38. D
39. A
40. A
41. C
42. A
43. B