Test Paper-V

1. The value of $\cos^2 73^\circ + \cos^2 47^\circ + \cos 73^\circ \cos 47^\circ$ is

(a) $\frac{1}{4}$ (b) $-\frac{1}{4}$

(c) $\frac{3}{4}$ (d) none of these

2. Given $\frac{\pi}{2} < \alpha < \pi$, then the expression

$$\sqrt{\frac{1-\sin\alpha}{1+\sin\alpha}} + \sqrt{\frac{1+\sin\alpha}{1-\sin\alpha}} =$$

(a) $\frac{1}{\cos\alpha}$ (b) $-\frac{2}{\cos\alpha}$

(c) $\frac{2}{\cos\alpha}$ (d) none of these

3. The minimum value of the expression

$$\sin\alpha + \sin\beta + \sin\gamma,$$

when α, β, γ are real numbers satisfying $\alpha + \beta + \gamma = \pi$ is

(a) -3 (b) negative

(c) positive (d) zero

4. The expression $2^{\sin\theta} + 2^{-\cos\theta}$ is minimum when θ is equal to

(a) $2n\pi + \frac{\pi}{4}, n \in I$ (b) $2n\pi + \frac{7\pi}{4}, n \in I$

(c) $n\pi \pm \frac{\pi}{4}, n \in I$ (d) none of these

5. If α and β be the solutions of $a\cos\theta + b\sin\theta = c$, then

(a) $\sin\alpha + \sin\beta = \frac{2bc}{a^2+b^2}$

(b) $\sin\alpha\sin\beta = \frac{c^2-a^2}{a^2+b^2}$

(c) $\sin\alpha + \sin\beta = \frac{2ac}{b^2+c^2}$

(d) $\sin\alpha\cdot\sin\beta = \frac{a^2-b^2}{b^2+c^2}$

6. If $\frac{3\pi}{4} < \alpha < \pi$, then $\sqrt{2\cot\alpha + \frac{1}{\sin^2\alpha}}$ is equal to

(a) $1 - \cot\alpha$ (b) $1 + \cot\alpha$

(c) $-1 + \cot\alpha$ (d) $-1 - \cot\alpha$

7. If A and B be acute positive angles satisfying $3\sin^2 A + 2\sin^2 B = 1$ and $3\sin 2A - 2\sin 2B = 0$, then

(a) $B = \frac{\pi}{4} - \frac{A}{2}$ (b) $A = \frac{\pi}{4} - 2B$

(c) $B = \frac{\pi}{2} - \frac{A}{4}$ (d) $A = \frac{\pi}{4} - \frac{B}{2}$.

8. The general solution of the equation $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta\tan 4\theta\tan 7\theta$ is

(a) $\theta = \frac{n\pi}{4}$ (b) $\theta = \frac{n\pi}{12}$

(c) $\theta = \frac{n\pi}{6}$ (d) none of these

9. The expression $(1 + \tan x + \tan^2 x)(1 - \cot x + \cot^2 x)$ has the positive value for x, given by:

(a) $0 \le x \le \pi/2$ (b) $0 \le x \le \pi$

(c) for all $x \in R$ (d) $x \ge 0$

10. If $\sin 3\alpha = 4\sin\alpha\sin(x+\alpha)\sin(x-\alpha)$, then $x =$

(a) $n\pi \pm \frac{\pi}{6}$ (b) $n\pi \pm \frac{\pi}{3}$

(c) $n\pi \pm \frac{\pi}{4}$ (d) $n\pi \pm \pi/2$

11. The equation $\sqrt{3}\sin x + \cos x = 4$ has

(a) only one solution (b) two solutions

(c) infinitely many solution

(d) no solution

12. Let $f(x) = e^{\cos^{-1}\sin\left(x+\frac{\pi}{3}\right)}$, then

(a) $f\left(\frac{8\pi}{9}\right) = e^{\frac{5\pi}{18}}$ (b) $f\left(\frac{8\pi}{9}\right) = e^{\frac{13\pi}{18}}$

(c) $f\left(-\frac{7\pi}{4}\right) = e^{\frac{\pi}{12}}$ (d) $f\left(-\frac{7\pi}{4}\right) = e^{\frac{11\pi}{12}}$

13. If $a \le \sin^{-1}x + \cos^{-1}x + \tan^{-1}x \le b$, then

(a) $a = \frac{\pi}{4}, b = \frac{3\pi}{4}$ (b) $a = 0, b = \pi$

(c) $a = -\frac{\pi}{4}, b = \frac{3\pi}{4}$ (d) none of these

14. If $a = \sin(\cot^{-1}x)$ and $b = \cot(\sin^{-1}x)$ where $x > 0$, then $\frac{1}{x^2} - x^2 =$

(a) $\frac{b^2}{a^2}$ (b) $\frac{a^2}{b^2}$

(c) $\frac{a^2+1}{b^2-1}$ (d) none of these

15. If $2\sin^{-1}x - 3\cos^{-1}x = 4$ then $2\sin^{-1}x + 3\cos^{-1}x$ equals

(a) $\dfrac{6\pi - 4}{5}$ (b) $\dfrac{4 - 6\pi}{5}$

(c) $\dfrac{3\pi}{2}$ (d) 0

16. If H is the orthocentre of ΔABC, then AH is equal to

(a) $c \cot A$ (b) $b \cot A$

(c) $a \cot B$ (d) $a \cot A$

17. The perimeter of a ΔABC is 6 times the arithmetic mean of the sines of its angles. If the side a is 1, then the angle A is

(a) $\dfrac{\pi}{6}$ (b) $\dfrac{\pi}{3}$

(c) $\dfrac{\pi}{2}$ (d) π

18. In any ΔABC, $1 - \tan\dfrac{A}{2}\tan\dfrac{B}{2} =$

(a) $\dfrac{a}{a+b+c}$ (b) $\dfrac{2a}{a+b+c}$

(c) $\dfrac{3a}{a+b+c}$ (d) none of these

19. In a triangle ABC, $\tan\dfrac{A}{2} = \dfrac{5}{6}$, $\tan\dfrac{C}{2} = \dfrac{2}{5}$, then

(a) a, c, b are in AP (b) a, b, c are in AP

(c) b, a, c are in AP (d) a, b, c are in GP

20. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 metres from its base is 45º. If the angle of elevation of the top of the complete pillar at the same point is to be 60º, then the height of the incomplete pillar is to be increased by

(a) $50\sqrt{2}$ mt (b) 100 mt

(c) $100(\sqrt{3} - 1)$ mt (d) $100(\sqrt{3} + 1)$ mt

21. A vertical lamp-post, 6 m high, stands at a distance of 2 m from a wall, 4 m high. A 1.5m tall man starts to walk away from the wall on the other side of the wall, in line with the lamp-post. The maximum distance to which the man can walk remaining in the shadow is

(a) 5/2 m (b) 3/2 m

(c) 4 m (d) none of these

22. A tower subtends an angle θ at a point P on the ground and the angle of depression of its foot from a point Q just above P is α. The height of the tower is

(a) $x \tan\theta \cot\alpha$ (b) $x \cot\theta \cot\alpha$

(c) $x \cot\theta \tan\alpha$ (d) $x \tan\theta \tan\alpha$

23. A ladder leans against a wall at an angle α to the horizontal. Its foot is pulled away through a distance a_1 so that it slides a distance b_1 down the wall and rests inclined at an angle β with the horizontal. Its foot is further pulled aways through a_2, so that it slides a further distance b_2 down the wall and is now inclined at the angle γ. If $a_1a_2 = b_1b_2$, then

(a) $\alpha + \beta + \gamma$ is greater than π

(b) $\alpha + \beta + \gamma$ is equal to π

(c) $\alpha + \beta + \gamma$ is less than π

(d) Nothing can be said about the sum

24. A ladder of length 'a' rests against the floor and a wall of a room. If the ladder begins to slide on the floor, then the locus of its middle point is

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

(c) $x^2 + y^2 = 2a^2$ (d) $4(x^2 + y^2) = a^2$

25. The image of the point (– 8, 12) with respect to the line mirror $4x + 7y + 13 = 0$ is

(a) (16, – 2) (b) (– 16, 2)

(c) (16, 2) (d) (– 16, – 2)

26. P is a point on either of the two lines $y - \sqrt{3}|x| = 2$ at a distance of 5 units from their point of intersection. The coordinates of the foot of the perpendicular from P on the bisector of the angle between them are

(a) $\left[0, \dfrac{1}{2}(4+5\sqrt{3})\right]$ or $\left[0, \dfrac{1}{2}(4-5\sqrt{3})\right]$ depending on which line the point P is taken

(b) $\left[0, \dfrac{1}{2}(4+5\sqrt{3})\right]$

(c) $\left[0, \dfrac{1}{2}(4-5\sqrt{3})\right]$ (d) $\left[\dfrac{5}{2}, \dfrac{5\sqrt{3}}{2}\right]$

27. The point (3, 2) is reflected in the y-axis and then moved a distance 5 units towards the negative side of y-axis. The coordinates of the point thus obtained are

(a) (3, – 3) (b) (– 3, 3)

(c) (3, 3) (d) (– 3, – 3)

28. The combined equation of bisectors of angles between coordinates axes, is

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

(c) $xy = 0$ (d) $x + y = 0$

29. The angle between the straight lines joining the origin to the points of intersection of $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y = 1$ is

(a) $\dfrac{\pi}{3}$ (b) $\dfrac{\pi}{4}$

(c) $\dfrac{\pi}{6}$ (d) $\dfrac{\pi}{2}$

30. The area of triangle formed by the lines $y^2 - 9xy + 18x^2 = 0$ and $y = 9$ is

(a) $-\frac{27}{4}$ (b) 0

(c) $\frac{9}{3}$ (d) 27

31. The equation $4x^2 + mxy - 3y^2 = 0$ represents, a pair of real and distinct lines if

(a) $m \in R$ (b) $m \in (3, 4)$

(c) $m \in (-3, 4)$ (d) $m > 4$

32. A circle of radius 5 touches the coordinate axes in the first quadrant. If the circle makes one complete roll on x-axis along the positive direction of x-axis, then its equation in the new position is

(a) $x^2 + y^2 - 10(2\pi + 1)x - 10y + 100\pi^2 + 100\pi + 25 = 0$

(b) $x^2 + y^2 + 10(2\pi + 1)x - 10y + 100\pi^2 + 100\pi + 25 = 0$

(c) $x^2 + y^2 - 10(2\pi + 1)x + 10y + 100\pi^2 + 100\pi + 25 = 0$

(d) none of these

33. The two circles $x^2 + y^2 + 2ax + c = 0$ and $x^2 + y^2 + 2by + c = 0$ touch each other if

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

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

34. If the circle $x^2 + y^2 - 4x - 6y + k = 0$ does not touch or intersect the axes and the point (2, 2) lies inside the circle, then

(a) $4 < k < 9$ (b) $4 < k < 12$

(c) $9 < k < 12$ (d) none of these

35. If the line $3x + ay - 20 = 0$ cuts the circle $x^2 + y^2 = 25$ at real, distinct or coincident points, then a belongs to the interval

(a) $[-\sqrt{7}, \sqrt{7}]$

(b) $(-\sqrt{7}, \sqrt{7})$

(c) $(-\infty - \sqrt{7}] \cup [\sqrt{7}, \infty)$

(d) none of these

36. The angle between the two tangents drawn from the point (1, 4) to the parabola $y^2 = 12x$ is

(a) $\tan^{-1}\left(\frac{1}{2}\right)$ (b) $\tan^{-1}\left(\frac{1}{3}\right)$

(c) $\tan^{-1}(2)$ (d) none of these

37. Equation of the parabola whose vertex is (– 3, – 2), axis is horizontal and which passes through the point (1, 2) is

(a) $y^2 + 4y + 4x - 8 = 0$

(b) $y^2 + 4y - 4x + 8 = 0$

(c) $y^2 + 4y - 4x - 8 = 0$

(d) none of these

38. A ray of light is coming along the line which is parallel to y-axis and strikes a concave mirror whose intersection with the xy-plane is a parabola $(x - 4)^2 = 4(y + 2)$. After reflection, the ray must pass through the point

(a) (4, – 1) (b) (0, 1)

(c) (– 4, 1) (d) none of these

39. The circle on focal radii of a parabola as diameter touches the

(a) axis

(b) directrix

(c) tangent at the vertex

(d) none of these

40. The domain of the function $f(x) = \sqrt{\cos^{-1}\left(\frac{1-|x|}{2}\right)}$ is

(a) $(-\infty, -3) \cup (3, \infty)$ (b) $[-3, 3]$

(c) $(-\infty, -3] \cup [3, \infty)$ (d) ϕ

41. The domain of the function

$$f(x) = \cos^{-1}\left(\frac{3}{4 + 2\sin x}\right) \text{ is}$$

(a) $\left[-\frac{\pi}{6} + 2n\pi, \frac{\pi}{6} + 2n\pi\right]$

(b) $\left(-\frac{\pi}{6} + 2n\pi, \frac{\pi}{6} + 2n\pi\right)$

(c) $\left(-\frac{\pi}{6} + 2n\pi, \frac{\pi}{6} + 2n\pi\right]$

(d) $\left[-\frac{\pi}{6} + 2n\pi, \frac{\pi}{6} + 2n\pi\right)$

42. The domain of the function

$f(x) = \log_{\left[x + \frac{1}{2}\right]} |x^2 - 5x + 6|$ is

(a) $\left[\frac{3}{2}, 2\right) \cup (2, 3) \cup (3, \infty)$

(b) $\left[\frac{3}{2}, \infty\right)$

(c) $\left[\frac{1}{2}, \infty\right)$

(d) none of these

43. The domain of the function

$f(x) = \log_3 [-(\log_3 x)^2 + 5 \log_3 x - 6]$ is

(a) $(0, 9) \cup (27, \infty)$ (b) $[9, 27]$

(c) $(9, 27)$ (d) none of these

44. If $f(x)$, $g(x)$ be differentiable functions and

$f(1) = g(1) = 2$ then

$\lim_{x\to1} \dfrac{f(1)g(x) - f(x)g(1) - f(1) + g(1)}{g(x) - f(x)}$ is equal to

(a) 0 (b) 1

(c) 2 (d) none of these

45. If $\lim_{x\to0} \dfrac{\sin 2x + a\sin x}{x^3}$ be finite, then the value of a and the limit are given by

(a) – 2, 1 (b) – 2, – 1

(c) 2, 1 (d) 2, – 1

46. $\lim_{x\to5} \dfrac{x^2 - 9x + 20}{x - [x]} =$

(a) 1 (b) 0

(c) does not exist (d) cannot be determined

47. $\lim_{x\to0} \left(\dfrac{1+\tan x}{1+\sin x}\right)^{1/\sin x}$ is equal to

(a) 0 (b) 1

(c) – 1 (d) none of these

48. If $f(x) = \begin{cases} \dfrac{1-\sin^2 x}{3\cos^2 x}, & x < \dfrac{\pi}{2} \\ a, & x = \dfrac{\pi}{2} \\ \dfrac{b(1-\sin x)}{(\pi - 2x)^2}, & x > \dfrac{\pi}{2} \end{cases}$. Then $f(x)$ is continuous at $x = \dfrac{\pi}{2}$, if

(a) $a = \dfrac{1}{3}, b = 2$ (b) $a = \dfrac{1}{3}, b = \dfrac{8}{3}$

(c) $a = \dfrac{2}{3}, b = \dfrac{8}{3}$ (d) none of these

49. The function $f(x) = \max.\{(1-x), (1+x), 2\}, x \in (-\infty, \infty)$, is

(a) continuous at all points

(b) differentiable at all points

(c) differentiable at all points except at $x = 1$ and $x = -1$.

(d) continuous at all points except at $x = 1$ and $x = -1$, where it is discontinuous.

50. The number of points at which the function

$f(x) = \dfrac{1}{\log|x|}$ is discontinuous, is

(a) 4 (b) 3

(c) 2 (d) 1

51. If $f(x) = |x - a|\,\phi(x)$, where $\phi(x)$ is continuous function and $\phi(o) = 0$, then

(a) $f'(a^+) = \phi(a)$ (b) $f'(a^-) = -\phi(a)$

(c) $f'(a^+) = f'(a^-)$ (d) none of these

52. If $y = e^{ax}\sin bx$, then $\dfrac{d^2y}{dx^2} - 2a\dfrac{dy}{dx}$ is equal to

(a) $-(a^2 + b^2)\,y$ (b) $(a^2 + b^2)\,y$

(c) $-y$ (d) none of these

53. If $y = x^{n-1}\log x$, then $x^2y_2 + (3 - 2n)\,xy_1$ is equal to

(a) $-(n-1)^2\,y$ (b) $(n-1)^2y$

(c) $-n^2y$ (d) n^2y

54. The derivative of $\tan^{-1}\dfrac{\sqrt{1+x^2}-1}{x}$ w.r.t. $\cos^{-1}\sqrt{\dfrac{1+\sqrt{1+x^2}}{2\sqrt{1+x^2}}}$ is

(a) 1 (b) – 1

(c) $\dfrac{1}{2}$ (d) none of these

55. If $y = \cos^{-1}\left(\dfrac{2\cos x - 3\sin x}{\sqrt{13}}\right)$, then $\dfrac{dy}{dx}$ is equal to

(a) 1 (b) 0

(c) constant ($\neq 1$) (d) none of these

56. The equation of the normal to the curve

$y = (1 + x)^y + \sin^{-1}(\sin^2 x)$ at $x = 0$ is

(a) $x + y = 2$ (b) $x + y = 1$

(c) $x - y = 1$ (d) none of these

57. If the slope of the tangent to the curve $y = e^x\cos x$ is minimum at $x = a$, $0 \le a \le 2\pi$, then the value of a is

(a) 0 (b) π

(c) 2π (d) none of these

58. Let $f(x) = \int e^x (x-1)(x-2)\,dx$. Then f decreases in the interval

(a) $(-\infty, -2)$ (b) $(-2, -1)$

(c) $(1, 2)$ (d) $(2, +\infty)$

59. The curve $y = ax^3 + bx^2 + cx + 5$ touches the x-axis at $A(-2, 0)$ and cuts the y-axis at a point B where its slope is 3. The values of a, b and c are

(a) $a = \dfrac{1}{2}, b = -\dfrac{3}{4}, c = 3$

(b) $a = -\dfrac{1}{2}, b = -\dfrac{3}{4}, c = 3$

(c) $a = \dfrac{1}{2}, b = \dfrac{3}{4}, c = 3$

(d) none of these

60. $\int e^{3\log x}\left(x^4 + 1\right)^{-1} dx$ is equal to

(a) $\frac{1}{4}$ log $(x^4 + 1) + C$
(b) – log $(x^4 + 1) + C$
(c) log $(x^4 + 1) + C$
(d) none of these

61. $\int \log\left(x+\sqrt{x^2+a^2}\right) dx$ is equal to

(a) $x \log\left(x+\sqrt{x^2+a^2}\right)+\sqrt{x^2+a^2} + C$

(b) $x \log\left(x+\sqrt{x^2+a^2}\right)-2\sqrt{x^2+a^2} + C$

(c) $x \log\left(x+\sqrt{x^2+a^2}\right)-\sqrt{x^2+a^2} + C$

(d) none of these

62. $\int \frac{e^{\tan^{-1}x}}{\left(1+x^2\right)}(1 + x + x^2)\, dx$ is equal to

(a) $\frac{e^{\tan^{-1}x}}{1+x^2}$ (b) $e^{\tan^{-1}x}\cdot(1 + x^2)$
(c) $xe^{\tan^{-1}x}$ (d) none of these

63. If $\int \frac{dx}{\sqrt{2ax-x^2}} = (f \circ g)(x) + C$, then

(a) $f(x) = \sin^{-1}x,\ g(x) = \frac{x+a}{a}$

(b) $f(x) = \sin^{-1}x,\ g(x) = \frac{x-a}{a}$

(c) $f(x) = \cos^{-1}x,\ g(x) = \frac{x-a}{a}$

(d) $f(x) = \tan^{-1}x,\ g(x) = \frac{x-a}{a}$.

64. $\int_0^\infty \left[\frac{2}{e^x}\right] dx$ (where [.] denotes the greatest integer function) equals

(a) $\log_e 2$ (b) e^2
(c) 0 (d) $\frac{2}{e}$

65. Given $\int_1^2 e^{x^2} dx = a$, the value of $\int_e^{e^4} \sqrt{\ln(x)}\, dx$ is

(a) $e^4 - e$ (b) $e^4 - a$
(c) $2e^4 - a$ (d) $2e^4 - e - a$

66. $\int_0^3 \left[\sqrt{x}\right] dx$ is equal to

(a) 1 (b) 2
(c) – 1 (d) – 2

67. $\int_{-2}^{1} [x + 1]\, dx$ is equal to

(a) 0 (b) 1
(c) – 1 (d) none of these

68. The general solution of the differential equation $y(x^2y + e^x)\, dx - e^x\, dy = 0$ is

(a) $x^3y - 3e^x = cy$ (b) $x^3y + 3e^x = cy$
(c) $y^3x - 3e^y = cx$ (d) $y^3x + 3e^y = cx$

69. The solution of the equation $\log \frac{dy}{dx} = 9x - xy + 6$, given that $y = 1$ when $x = 0$, is

(a) $3e^{6y} = 2e^{9x-6} + 6e^6$ (b) $3e^{6y} = 2e^{9x+6} - 6e^6$
(c) $3e^{6y} = 2e^{9x+6} + e^6$ (d) none of these

70. The order of the differential equation satisfying

$\sqrt{1-x^4} + \sqrt{1-y^4} = a(x^2 - y^2)$. is

(a) 1 (b) 2
(c) 3 (d) none of these

71. The particular solution of
$\cos y\, dx + (1 + 2e^{-x}) \sin y\, dy = 0$,

when $x = 0$, $y = \frac{\pi}{4}$ is

(a) $e^x - 2 = 3\sqrt{2}\cos y$
(b) $e^x + 2 = \sqrt{2}\cos y$
(c) $e^x + 2 = 3\sqrt{2}\cos y$
(d) none of these

72. If $\left|\frac{z-5i}{z+6i}\right| = 1$, then locus of z is

(a) x-axis (b) y-axis
(c) $x = 1$ (d) $y = 1$

73. If $z_r = \cos\left(\frac{\pi}{3^r}\right) + i\sin\left(\frac{\pi}{3^r}\right)$, $r = 1, 2, 3, \ldots$, then $z_1 z_2 z_3 \ldots \infty =$

(a) i (b) $-i$
(c) 1 (d) – 1

74. The solution of the equation $|z| - z = 1 + 2i$ is

(a) $\frac{3}{2} - 2i$ (b) $\frac{3}{2} + 2i$

(c) $2 - \frac{3}{2}i$ (d) none of these

75. The locus of the complex number z in the Argand plane if $\left|\frac{1-iz}{z-i}\right| = 1$, is

(a) a circle (b) x-axis
(c) y-axis (d) none of these

76. $\sqrt{-1-\sqrt{-1-\sqrt{-1-\ldots \text{ to } \infty}}} =$

(a) 1 (b) -1

(c) ω (d) ω^2

77. The maximum sum of the series

$20 + 19\frac{1}{3} + 18\frac{2}{3} + 18 + \ldots$ is

(a) 310 (b) 290

(c) 320 (d) none of these

78. The minimum number of terms from the beginning of the series $20 + 22\frac{2}{3} + 25\frac{1}{3} + \ldots$, so that the sum may exceed 1568, is

(a) 25 (b) 27

(c) 28 (d) 29

79. A club consists of members whose ages are in A.P., the common difference being 3 months. If the youngest member of the club is just 7 years old and the sum of the ages of all the members is 250 years, then the number of members in the club are

(a) 15 (b) 25

(c) 20 (d) 30

80. If a, b, c are respectively the xth, yth and zth terms of a G.P., then

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

(a) 1 (b) -1

(c) 0 (d) none of these

81. If r be the ratio of the roots of the equation

$ax^2 + bx + c = 0$, then $\frac{(r+1)^2}{r} =$

(a) $\frac{a^2}{bc}$ (b) $\frac{b^2}{ca}$

(c) $\frac{c^2}{ab}$ (d) none of these

82. The value of k so that the equations $x^2 - x - 12 = 0$ and $kx^2 + 10x + 3 = 0$ may have one root in common, is

(a) $\frac{43}{16}$ (b) 3

(c) -3 (d) $\frac{-43}{16}$

83. If the equations $ax^2 + bx + c = 0$ and $x^2 + 2x + 3 = 0$ have a common root, then $a : b : c =$

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

(c) $1:2:3$ (d) none of these

84. For the equation $|x^2| + |x| - 6 = 0$, the roots are

(a) real and equal (b) real with sum 0

(c) real with sum 1 (d) real with product 0

85. For $2 \le r \le n$, $\binom{n}{r} + 2\binom{n}{r-1} + \binom{n}{r-2} =$

(a) $\binom{n+1}{r-1}$ (b) $2\binom{n+1}{r+1}$

(c) $2\binom{n+2}{r}$ (d) $\binom{n+2}{r}$

86. The total number of 8 digits numbers which have all different digits is

(a) 3265920 (b) 3265860

(c) 3268620 (d) none of these

87. Three boys and three girls are to be seated around a table, in a circle. Among them, the boy X does not want any girl neighbour and the girl Y does not want any boy neighbour. The number of such arrangements possible is

(a) 4 (b) 6

(c) 8 (d) none of these

88. A telegraph has 5 arms and each arm is capable of 4 distinct positions, including the position of rest. The total number of signals that can be made is

(a) 473 (b) 1023

(c) 1173 (d) none of these

89. The term independent of x in $(1+x)^m\left(1+\frac{1}{x}\right)^n$ is

(a) ${}^{m+n}C_m$ (b) ${}^{m+n}C_n$

(c) ${}^{m+n}C_{m-n}$ (d) none of these

90. The coefficient of x^3 in the expansion of $(1-x+x^2)^6$ is

(a) 50 (b) -50

(c) 68 (d) none of these

91. The coefficient of x^4 in the expansion of $(1+x+x^2+x^3)^{11}$ is

(a) 990 (b) 605

(c) 810 (d) none of these

92. If $C_0, C_1, C_2, \ldots, C_n$ are the coefficients of the expansion of $(1+x)^n$, then the value of $\sum_0^n \frac{C_k}{k+1}$ is

(a) 0 (b) $\frac{2^n-1}{n}$

(c) $\frac{2^{n+1}-1}{n+1}$ (d) none of these

93. The sum of the series $1 + \frac{3}{2!} + \frac{5}{4!} + \frac{7}{6!} + \ldots\infty$ is

(a) e (b) $2e$

(c) $3e$ (b) none of these

94. The series $3\log 2+\frac{1}{4}-\frac{1}{2}\left(\frac{1}{4}\right)^2+\frac{1}{3}\left(\frac{1}{4}\right)^3$ ... is equal to

(a) log 3 (b) log 5

(c) log 10 (d) none of these

95. The value of $1+\frac{1+a}{2!}+\frac{1+a+a^2}{3!}+\ldots\infty$ is

(a) $\frac{e-e^a}{a-1}$ (b) $\frac{e^a-e}{a-1}$

(c) $\frac{e^{a-1}-e}{a-1}$ (d) none of these

96. The sum of the series $\frac{1}{2\cdot 3}+\frac{1}{4\cdot 5}+\frac{1}{6\cdot 7}+\ldots$ is

(a) $\log\left(\frac{e}{2}\right)$ (b) $\log\left(\frac{2}{3}\right)$

(c) $\frac{e}{2}$ (d) $\frac{2}{e}$

97. If A and B are two matrices such that $AB = B$ and $BA = A$, then $A^2 + B^2 =$

(a) $2AB$ (b) $2BA$

(c) $A+B$ (d) AB

98. If A and B are square matrices of same order such that $(A+B)^2 = A^2 + B^2 + 2AB$, then

(a) $AB = BA$ (b) $A = B$

(c) $A = B'$ (d) $A = -B$

99. If A, B are two $n \times n$ non-singular matrices, then

(a) AB is non-singular

(b) AB is singular

(c) $(AB)^{-1} = A^{-1}B^{-1}$

(d) $(AB)^{-1}$ does not exist

100. The value of a for which the system of equations $ax + y + z = 0$, $x + ay + z = 0$, $x + y + z = 0$, possess non-zero solutions are given by

(a) 1, 2 (b) 1, –1

(c) 1 (d) none of these

Answer keys

1. (c)	2. (b)	3. (c)	4. (b)	5. (a, b)	6. (d)
7. (a)	8. (a, c)	9. (c)	10. (a)	11. (d)	12. (c)
13. (b)	14. (a)	15. (b)	16. (b)	17. (d)	18. (b)
19. (a, d)	20. (b)	21. (a)	22. (a)	23. (b)	24. (d)
25. (d)	26. (b)	27. (d)	28. (c)	29. (c)	30. (a)
31. (b)	32. (a)	33. (c)	34. (c)	35. (c)	36. (a)
37. (c)	38. (a)	39. (c)	40. (b)	41. (a)	42. (a)
43. (c)	44. (c)	45. (b)	46. (c)	47. (b)	48. (a, b)
49. (c)	50. (a)	51. (c)	52. (b)	53. (a)	54. (c)
55. (b)	56. (c)	57. (a, d)	58. (b, c)	59. (a)	60. (c)
61. (a)	62. (c)	63. (b)	64. (a)	65. (d)	66. (b)
67. (a)	68. (b)	69. (c)	70. (a)	71. (c)	72. (a)
73. (a)	74. (c, d)	75. (b)	76. (a)	77. (d)	78. (b)
79. (c)	80. (b)	81. (b, d)	82. (c)	83. (b)	84. (d)
85. (a)	86. (a)	87. (b)	88. (b)	89. (b)	90. (a)
91. (c)	92. (a)	93. (c)	94. (b)	95. (a)	96. (c)
97. (a)	98. (a)	99. (c)	100. (b)		