KALAIMAGAL MATRIC HIGHER SECONDARY SCHOOL, MOHANUR.

STD : XII MATHEMATICS **MARKS: 50**

DATE: ONE MARK TEST-V (BB FULLY) **TIME: 30 min**

Choose the correct answer: **50 x 1 = 50**

1. If $(AB)^{-1} = \begin{bmatrix} 12 & -17 \\ -19 & 27 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$, then B^{-1}
   1) $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$ 2) $\begin{bmatrix} 8 & 5 \\ 3 & 2 \end{bmatrix}$ 3) $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 8 & -5 \\ -3 & 2 \end{bmatrix}$

2. If $x^a y^b = e^m$, $x^c y^d = e^n$, $\Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}, \Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}, \Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, then the value of x and y are respectively,
   1) $e^{(\Delta_2/\Delta_1)}, e^{(\Delta_3/\Delta_1)}$ 2) $\log(\Delta_1/\Delta_3), \log(\Delta_2/\Delta_3)$
   3) $\log(\Delta_2/\Delta_1), \log(\Delta_3/\Delta_1)$ 4) $e^{(\Delta_1/\Delta_3)}, e^{(\Delta_2/\Delta_3)}$

3. If $\rho(A) = \rho([A|B])$, then the system $AX = B$ of linear equation is
   1) Consistent and has a unique solution 2) Consistent
   3) Consistent and has infinitely many solution 4) Inconsisitent

4. If $0 \le \theta \le \pi$ and the system of equations $x + (\sin\theta)y - (\cos\theta)z = 0, (\cos\theta)x - y + z = 0,$ $(\sin\theta)x + y - z = 0$ has a non-trivial solution then θ is
   1) $\frac{2\pi}{3}$ 2) $\frac{3\pi}{4}$ 3) $\frac{5\pi}{6}$ 4) $\frac{\pi}{4}$

5. Let $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and $4B = \begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & x \\ -1 & 1 & 3 \end{bmatrix}$. If B is the inverse of A, then the value of x is
   1) 2 2) 4 3) 3 4) 1

6. The solution of the equation $|z| - z = 1 + 2i$ is
   1) $\frac{3}{2} - 2i$ 2) $-\frac{3}{2} + 2i$ 3) $2 - \frac{3}{2}i$ 4) $2 + \frac{3}{2}i$

7. If $(1+i)(1+2i)(1+3i)....(1+ni) = x + iy$, then $2.5.10...(1+n^2)$ is
   1) 1 2) i 3) $x^2 + y^2$ 4) $1 + n^2$

8. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{2020} + \beta^{2020}$ is
   1) −2 2) −1 3) 1 4) 2

9. If $\omega \ne 1$ is a cubic root of unity and $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k$, then k is equal to
   1) 1 2) -1 3) $\sqrt{3}i$ 4) $-\sqrt{3}i$

10. If $\omega = cis\frac{2\pi}{3}$, then the number of distinct roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$
    1) 1 2) 2 3) 3 4) 4

11. The polynomial $x^3 + 2x + 3$ has
    1) one negative and two imaginary zeros 2) one positive and two imaginary zeros
    3) three real zeros 4) no zeros

12. The number of positive zeros of the polynomial $\sum_{j=0}^{n} {}^{n}C_r(-1)^r x^r$ is

1) 0 2) n 3) $< n$ 4) r

13. If the function $f(x) = \sin^{-1}(x^2 - 3)$, then x belongs to

1) $[-1,1]$ 2) $[\sqrt{2}, 2]$ 3) $[-2, -\sqrt{2}] \cup [\sqrt{2}, 2]$ 4) $[-2, -\sqrt{2}]$

14. $\sin^{-1}(2\cos^2 x - 1) + \cos^{-1}(1 - 2\sin^2 x) =$

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

15. If $\sin^{-1} x + \cot^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}$, then x is equal to

1) $\frac{1}{2}$ 2) $\frac{1}{\sqrt{5}}$ 3) $\frac{2}{\sqrt{5}}$ 4) $\frac{\sqrt{3}}{2}$

16. $\sin(\tan^{-1} x), |x| < 1$ is equal to

1) $\frac{x}{\sqrt{1-x^2}}$ 2) $\frac{1}{\sqrt{1-x^2}}$ 3) $\frac{1}{\sqrt{1+x^2}}$ 4) $\frac{x}{\sqrt{1+x^2}}$

17. The equation of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ having centre at $(0,3)$ is

1) $x^2 + y^2 - 6y - 7 = 0$ 2) $x^2 + y^2 - 6x + 7 = 0$ 3) $x^2 + y^2 - 6y - 5 = 0$ 4) $x^2 + y^2 - 6y + 5 = 0$

18. Area of the greatest rectangle inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

1) $2ab$ 2) ab 3) $\sqrt{ab}$ 4) $\frac{a}{b}$

19. The eccentricity of the ellipse $(x-3)^2 + (y-4)^2 = \frac{y^2}{9}$ is

1) $\frac{\sqrt{3}}{2}$ 2) $\frac{1}{3}$ 3) $\frac{1}{3\sqrt{2}}$ 4) $\frac{1}{\sqrt{3}}$

20. The circle passing through $(1,-2)$ and touching the axis of x at $(3,0)$ passing through the point

1) $(-5,2)$ 2) $(2,-5)$ 3) $(5,-2)$ 4) $(-2,5)$

21. The values of m for which the line $y = mx + 2\sqrt{5}$ touches the hyperbola $16x^2 - 9y^2 = 144$ are the roots of $x^2 - (a+b)x - 4 = 0$, then the value of $(a+b)$ is

1) 2 2) 4 3) 0 4) -2

22. Consider the vectors $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ such that $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = \vec{0}$. Let P_1 and P_2 be the planes determined by the pairs of vectors $\vec{a}, \vec{b}$, and $\vec{c}, \vec{d}$ respectively. Then the angle between P_1 and P_2 is

1) 0° 2) 45° 3) 60° 4) 90°

23. The coordinates of the point where the line $\vec{r} = (6\hat{i} - \hat{j} - 3\hat{k}) + t(-\hat{i} + \hat{j} + 4\hat{k})$ meets the plane $\vec{r}.(\hat{i} + \hat{j} + \hat{k}) = 3$ are

1) (2,1,0) 2) (7, −1, −7) 3) (1,2, −6) 4) (5, −1,1)

24. If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$, then

1) $c = \pm 3$ 2) $c = \pm\sqrt{3}$ 3) $c > 0$ 4) $0 < c < 1$

25. The maximum product of two positive numbers, when their sum of the squares is 200, is

1) 100 2) $25\sqrt{7}$ 3) 28 4) $24\sqrt{14}$

26. The vector equation $\vec{r} = (\hat{i} - 2\hat{j} - \hat{k}) + t(6\hat{i} + \hat{j} - \hat{k})$ represents a straight line passing through the points

1) (0,6, −1) and (1, −2, −1) 2) (0,6, −1) and (−1, −4, −2)
3) (1, −2, −1) and (−1, 4, −2) 4) (1, −2, −1) and (0, −6,1)

27. If the planes $\vec{r}.(2\hat{i} - \lambda\hat{j} + \hat{k}) = 3$ and $\vec{r}.(4\hat{i} - \hat{j} - \mu\hat{k}) = 5$ are parallel, then the value of λ and μ are

1) $\frac{1}{2}, -2$ 2) $-\frac{1}{2}, 2$ 3) $-\frac{1}{2}, -2$ 4) $\frac{1}{2}, 2$

28. Find the point on the curve $6y = x^3 + 2$ at which y-coordinate changes 8 times as fast as x-coordinate is

1) $(4,11)$ 2) $(4,-11)$ 3) $(-4,11)$ 4) $(-4,-11)$

29. The function $\sin^4 x + \cos^4 x$ is increasing in the interval

1) $\left[\frac{5\pi}{8}, \frac{3\pi}{4}\right]$ 2) $\left[\frac{\pi}{2}, \frac{5\pi}{8}\right]$ 3) $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$ 4) $\left[0, \frac{\pi}{4}\right]$

30. The curve $y = ax^4 + bx^2$ with $ab > 0$

1) has no horizontal tangent 2) is concave up
3) is concave down 4) has no points of inflection

31. The approximate change in the volume V of a cube of side x metres caused by increasing the side by 1% is

1) $0.3xdxm^3$ 2) $0.03xm^3$ 3) $0.03x^2m^3$ 4) $0.03x^3m^3$

32. If $u(x,y) = x^2 + 3xy + y = 2019$, then $\left.\frac{\partial u}{\partial x}\right|_{(4,-5)}$ is equal to

1) -4 2) -3 3) -7 4) 13

33. If $w(x,y,z) = x^2(y-z) + y^2(z-yx) + z^2(x-y)$, then $\frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$ is

1) $xy + yz + zx$ 2) $x(y+z)$ 3) $y(z+x)$ 4) 0

34. The value of $\int_0^{\frac{\pi}{6}} \cos^3 3x \, dx$ is

1) $\frac{2}{3}$ 2) $\frac{2}{9}$ 3) $\frac{1}{9}$ 4) $\frac{1}{3}$

35. The value of $\int_0^{\infty} e^{-3x} x^2 \, dx$ is

1) $\frac{7}{27}$ 2) $\frac{5}{27}$ 3) $\frac{4}{27}$ 4) $\frac{2}{27}$

36. If $\int_1^x \frac{e^{\sin u}}{u} du,\ x > 1,$ and $\int_1^3 \frac{e^{\sin x^2}}{x} dx = \frac{1}{2}[f(a) - f(1)],$ then one of the possible value of a is

1) 3 2) 6 3) 9 4) 5

37. The value of $\int_0^a \left(\sqrt{a^2 - x^2}\right)^3 dx$ is

1) $\frac{\pi a^3}{16}$ 2) $\frac{3\pi a^4}{16}$ 3) $\frac{3\pi a^2}{8}$ 4) $\frac{3\pi a^4}{8}$

38. The degree of the differential equation $y(x) = 1 + \frac{dy}{dx} + \frac{1}{1.2}\left(\frac{dy}{dx}\right)^2 + \frac{1}{1.2.3}\left(\frac{dy}{dx}\right)^3 + ...$ is

1) 2 2) 3 3) 1 4) 4

39. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax+3}{2y+f}$ represents a circle, then the value of a is

1) 2 2) -2 3) 1 4) -1

40. The solution of $\frac{dy}{dx} = 2^{y-x}$ is

1) $2^x + 2^y = C$ 2) $2^x - 2^y = C$ 3) $\frac{1}{2^x} - \frac{1}{2^y} = C$ 4) $x + y = C$

41. Integrating factor of the differential equation $\frac{dy}{dx} = \frac{x+y+1}{x+1}$ is

1) $\frac{1}{x+1}$ 2) $x+1$ 3) $\frac{1}{\sqrt{x+1}}$ 4) $\sqrt{x+1}$

42. The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through $(-1,1)$.

Then the equation of the curve is

1) $y = x^3 + 2$ 2) $y = 3x^2 + 4$ 3) $y = 3x^3 + 4$ 4) $y = x^3 + 5$

43. Two coins are to be flipped. The first coin will land on heads with probability 0.6, the second with Probability 0.5. Assume that the results of the flips are independent, and let X equal the total number of heads that result. The value of $E[X]$ is

1) 0.11 2) 1.1 3)11 4)1

44. Suppose that X takes on one of the values 0, 1, and 2. If for some constant k, $P(X = i) = k\,P(X = i-1)$ for $i = 1,\ 2$ and $P(X = 0) = \frac{1}{7}$. Then the value of k is

1) 1 2) 2 3) 3 4) 4

45. If $f(x) = \begin{cases} 2x & 0 \le x \le a \\ 0 & otherwise \end{cases}$ is a probability density function of a random variable, then the value of a is

1) 1 2) 2 3) 3 4) 4

46. The probability function of a random variable is defined as:

x	-2	-1	0	1	2
$f(x)$	k	$2k$	$3k$	$4k$	$5k$

Then $E(X)$ is equal to:

1) $\frac{1}{15}$ 2) $\frac{1}{10}$ 3) $\frac{1}{3}$ 4) $\frac{2}{3}$

47.

p	q	$(p \wedge q) \to \neg p$
T	T	(a)
T	F	(b)
F	T	(c)
F	F	(d)

Which one of the following is correct for the truth value of $(p \wedge q) \to \neg p$?

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

48. The dual of $\neg(p \vee q) \vee [p \vee (p \wedge \neg r)]$ is

1) $\neg(p \wedge q) \wedge [p \vee (p \wedge \neg r)]$ 2) $(p \wedge q) \wedge [p \wedge (p \vee \neg r)]$

3) $\neg(p \wedge q) \wedge [p \wedge (p \wedge r)]$ 4) $\neg(p \wedge q) \wedge [p \wedge (p \vee \neg r)]$

49. Subtraction is not a binary operation in

1) $\mathbb{R}$ 2) $\mathbb{Z}$ 3) $\mathbb{N}$ 4) $\mathbb{Q}$

50. Which one of the following is not true?

1) Negation of a negation of a statement is the statement itself.
2) If the last column of the truth table contains only T then it is a tautology.
3) If the last column of its truth table contains only F then it is a contradiction
4) If p and q are any two statements then $p \leftrightarrow q$ is a tautology.