DAV PUBLIC SCHOOL SEC-14, FBD.

HALFYEARLY - 2021-22

Subject: Mathematics (041)
Time: 90 Minutes.
Date: 29.09.2021
No of questions: 50

Class: XII
Max Marks: 40
Day:Wednesday

General Instructions:

- This Q Paper contains three sections: A, B, C. Each section is compulsory.
- Section A has 20 $MCQ^s (Q No. 1 - 20)$. Attempt any 16 out of 20.
- Section B has 20 $MCQ^s (Q No. 21 - 40)$. Attempt any 16 out of 20.
- Section C has 10 $MCQ^s (Q No 41 - 50)$. Attempt any 8 out of 10.
- There is no negative marking. All questions carry equal marks. (1 mark each)

SECTION A (Attempt any 16 questions)

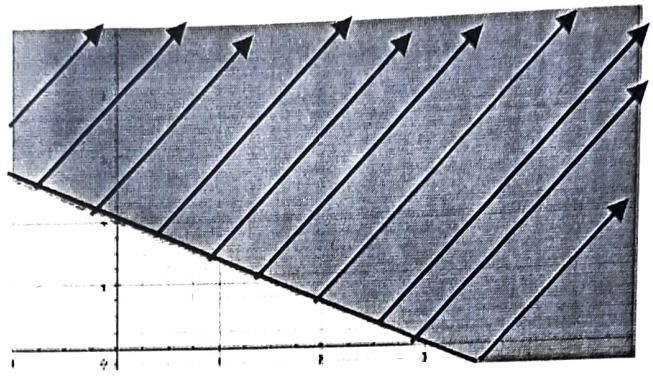
1. The domain of the function $sin^{-1}(2x - 1)$ is
   (a) $[0, 1]$ (b) $[-1, 1]$ (c) $(-1,1)$ (d) $[0, \pi]$
2. The number of points at which the function $f(x) = \frac{1}{x - [x]}$ is not continuous is
   (a) 1 (b) 2 (c) 3 (d) None of these
3. If $If\ A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ satisfies $A^2 + xI = yA$ then $(x, y) =$
   (a) (8, 8) (b) (-8, 8) (c) (-8, -8) (d) None of these
4. The value of $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + 2 \begin{bmatrix} 4 \\ 5 \end{bmatrix} =$
   (a) $\begin{bmatrix} 4 & 5 \\ 4 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} 43 \\ 45 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & 4 \\ 4 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 43 \\ 50 \end{bmatrix}$
5. The function $f(x) = tan\ x - x$
   (a) is always increasing (b) is always decreasing
   (c) never increases (d) is neither increasing nor decreasing
6. If $|Adj\ A| = 64$ for a 2 X 2 matrix A, then $|A| = ?$
   (a) 8 (b) -8 (c) 64 (d) -64
7. If A is a non singular matrix of order 3 and $A^2 = 3A$, then |A|=
   (a) -3 (b) 3 (c) 9 (d) 27
8. If x is real then minimum value of $x^2 - 8x + 17$ is
   (a) -1 (b) 0 (c) 1 (d) 2
9. The value of $sin[cot^{-1}(tan\ (cos^{-1}x))]$ is
   (a) $\sqrt{1 - x^2}$ (b) 1 (c) x (d) x^2

10. Which of the following functions from Z *into* Z is a bijection?

(a) $f(x) = x^3$ (b) $f(x) = x^2 + 1$ (c) $f(x) = 2x + 1$ (d) $f(x) = x + 2$

11. In the following figure the shaded region is represented by

(a) $3y - 2x \leq 6$ (b) $2x + 3y \leq 6$ (c) $2x + 3y \leq -6$ (d) $2x + 3y \geq 6$



12. If A is a singular matrix then A(adj A) is

(a) a Null matrix. (b) a Row matrix. (c) Identity matrix (d) None of these.

13. The relation 'R' defined on the set $A = \{1, 2, 3, 4\}$ by $R = \{(1, 2), (3, 4)\}$ is

(a) Reflexive (b) Symmetric (c) Transitive (d) None of these

14. If $y = log(\sqrt{tan\ x})$ then $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is

(a) 0 (b) $\frac{1}{2}$ (c)1 (d) ∞

15. If $x = 2at$ & $y = at^2$ then $\frac{d^2y}{dx^2} =$

(a) 0 (b) $\frac{1}{2a}$ (c) $\frac{1}{2a^3}$ (d) $-\frac{1}{2a^3}$

16. If A is a matrix of order m X n and B is a matrix such that AB' & $B'A$ both are defined then the order of B is

(a) m X m (b) n X n (c) n X m (d) m X n

17. If $x + y = 9$, then maximum value of x^2y is

(a) 64 (b) 80 (c) 100 (d) 108

18. If A_{ij} is the cofactor of a_{ij} of the determinant of $A = \begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$, then

$a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23} =$

(a) 0 (b) |A| (c) Adj A (d) 1

19. If $y = 2^x.3^x$ then derivative of y w.r.t x is

(a) $2^x\ log2 + 3^x\ log3$ (b) $2^x\ log3 + 3^x\ log2$

(c) $2^x.3^x.log2.log3$ (d) $2^x.3^x.log6$

20. The point on the curve $y = 2x^2 - 6x - 4$ at which the tangent is parallel to x-axis is

(a) $\left(-\frac{3}{2}, -\frac{17}{2}\right)$ (b) $\left(\frac{3}{2}, \frac{17}{2}\right)$ (c) $\left(-\frac{3}{2}, \frac{17}{2}\right)$ (d) $\left(\frac{3}{2}, -\frac{17}{2}\right)$

SECTION B (Attempt any 16 questions)

21. The slope of tangent at $(5, 3)$ for the function $x = t^2 - 5t - 1$, $y = t^2 - 7t + 9$ is.

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

22. The function $f : N \to N$ defined as $f(x) = x^2 + 1$ is

(a) Bijective (b) Surjective but not Injective.

(c) Injective but not Surjective (d) Neither Injective nor Surjective.

23. The derivative of $log\ x$ w.r.to $\frac{1}{x}$ is

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

24. If the objective function for a LPP is $Z = 5x + 7y$ and the corner points of the bounded feasible region are $(0, 0), (7, 0), (3, 4)$ and $(0, 2)$. Then the sum of maximum and minimum value of Z is

(a) 0 (b) 14 (c) 35 (d) 43

25. The derivative of $cos^{-1}(2x\sqrt{1-x^2})$ with respect to $sin^{-1}x$ is

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

26. If $A = [a_{ij}]_{2X2}$ where $a_{ij} = \begin{cases} 1 & if\ i \neq j \\ 0 & if\ i = j \end{cases}$ then $A^2 =$

(a) I (b) A (c) O (d) None of these.

27. Simplest form of $tan^{-1}\left(\frac{sin\ x}{1 + cos\ x}\right)$ is

(a) $\frac{\pi}{4} - \frac{x}{2}$ (b) $\frac{\pi}{4} + \frac{x}{2}$ (c) $-\frac{x}{2}$ (d) $\frac{x}{2}$

28. If $A = \begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$ is a skew symmetric matrix then the value of $(a + b + c)^2$ is.

(a) 1 (b) 0 (c) 4 (d) None of these

29. The value of c for which the function $f(t) = t + cost + c$ is strictly decreasing in R is

(a) $c < 1$ (b) No value of c exists (c) $c \leq 1$ (d) $c \geq 1$

30. Let $R = \{(L_1, L_2);\ L_1\ is\ parallel\ to\ L_2\ where\ L_1\ is\ y = x - 4\}$.

Which of the following can be taken as L_2?

(a) $2x - 2y + 5 = 0$ (b) $2x + y = 5$

(c) $2x + 2y + 7 = 0$ (d) $x + y = 7$

31. The points at which $f(x) = \begin{cases} \frac{|x|}{x} & if\ x < 0 \\ -1 & if\ x \geq 0 \end{cases}$ is continuous is/are

(a) $x \in R$ (b) $x = 0$ (c) $x = \pm 1$ (d) $x \in R - \{0\}$

32. If $A = \begin{bmatrix} \frac{1}{3} & 2 \\ 0 & 2x-3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$, $AB = I_2$ then the value of x is

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

33. The corner points of feasible region are $(0,0)$, $(4,0)$, $(2,4)$ and $(0,5)$. If the maximum value of $Z = ax + by$ occurs at both $(2,4)$ and $(4,0)$, then

(a) $a = 2b$ (b) $2a = b$ (c) $a = b$ (d) $3a = b$

34. The function $f(x) = x(x-3)^2$ decreases for

(a) $1 \leq x \leq 3$ (b) $x \leq 0$ (c) $x \geq 0$ (d) $0 \leq x \leq \frac{3}{2}$

35. The principal value of $tan^{-1}(tan\ \frac{3\pi}{5})$ is

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

36. If A is a square matrix of order 3 such that $|A| = 5$, then $|-2A^{-1}|$ is

(a) $\frac{4}{5}$ (b) $-\frac{4}{5}$ (c) $\frac{8}{5}$ (d) $-\frac{8}{5}$

37. The relation R on real numbers given by $R_1 = \{(a, b);\ a \leq b^2\}$ is

(a) Reflexive only (b) Reflexive and Transitive

(c) Transitive only (d) Neither reflexive nor Transitive.

38. If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$ then x is

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

39. For what value of k inverse does not exist for the matrix $A = \begin{bmatrix} 1 & 2 \\ k & 6 \end{bmatrix}$?

(a) 0 (b) 2 (c) 3 (d) 6

40. The equation of normal to the function $x = sin3t$, $y = cos2t$ at $t = \frac{\pi}{4}$ is

(a) $3\sqrt{2}x - 4y = 3$ (b) $3\sqrt{2}x + 4y + 3 = 0$

(c) $3\sqrt{2}x + 4y - 3 = 0$ (d) $-3\sqrt{2}x + 4y + 3 = 0$

SECTION C (Attempt any 8 questions)

41. The constraints in a L P P are $x - 3y \geq 0$, $y \geq 0$, $0 \leq x \leq 3$ then the feasible region

(a) is not in the I quadrant (b) is bounded in the I quadrant

(c) is unbounded in the I quadrant (d) does not exist.

42. The curve $y = x^{\frac{1}{5}}$ has _____ at $(0, 0)$

(a) a vertical tangent (parallel to y-axis) (b) a horizontal tangent (parallel to x-axis)

(c) an oblique tangent (d) no tangent.

43. If $f(x) = \begin{cases} x^2 + 3x + a & if\ x \leq 1 \\ bx + 2 & if\ x > 1 \end{cases}$ is differentiable every where then $(a, b) =$

(a) $(3, 5)$ (b) $(0, 5)$ (c) $(0, 3)$ (d) $(3, 3)$

44. Maximum value of $Z = x + y$ subject to $x \leq 2,\ y \leq 2,\ x, y \geq 0$ is

(a) 4 (b) 2 (c) 1 (d) None of these

45. If $A = \begin{vmatrix} -a & 1 & 1 \\ 1 & -a & 1 \\ 1 & 1 & -a \end{vmatrix}$ and $B = \begin{vmatrix} a & 1 \\ 1 & a \end{vmatrix}$ then $\frac{dA}{da} =$

(a) 3B (b) $-3B$ (c) 1+3B (d) 1–3B

Question no. 46 to 50 are based on the following statement.

One day a helicopter of enemy was flying in a track given by $y = x^2 + 7$. A soldier standing at $(3, 7)$ wants to shoot the helicopter when it is at the nearest point to him. Now answer the following questions.

46. If (h, k) represents the position of the helicopter on the curve $y = x^2 + 7$ when the distance from the soldier is minimum then the relation between h & k is

(a) $h = k^2 + 7$ (b) $k = h^2 + 7$

(c) $k + h^2 = 7$ (d) $h + k^2 = 7$

47. Distance D is given by

(a) $D = h^2 - 6h + h^4$ (b) $D = h^2 + 6h + 9 + h^4$

(c) $D^2 = h^2 - 6h + 9 + h^4$ (d) $D^2 = h^2 + 6h - 9 + h^4$

48. The value of k for nearest distance is

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

49. The nearest distance D is

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

50. The nearest position of the helicopter from the soldier is

(a) $(1, \sqrt{5})$ (b) $(1, 8)$ (c) $(1, 7)$ (d) $(1, \sqrt{7})$

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