INDIAN SCHOOL AL WADI AL KABIR

Practice Paper-Term 1(2024-25)

SUB: Mathematics (041)

Date: 08/09/2024 Time Allowed :3 hours

Class: XII Maximum Marks: 80

General Instructions:

1. *This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.*
2. *Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.*
3. *Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.*
4. *Section C has 6 Short Answer (SA)-type questions of 3 marks each.*
5. *Section D has 4 Long Answer (LA)-type questions of 5 marks each.*
6. *Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.*

Q. No | SECTION A (MCQ) | Marks

1. If $f(x) = \begin{cases} \frac{cosx}{\frac{\pi}{2}-x} \\ k \end{cases}, \begin{matrix} x \neq \frac{\pi}{2} \\ x = \frac{\pi}{2} \end{matrix}$ is continuous at x= $\frac{\pi}{2}$ then value of k. 1

A 0 **B** 1 **C** 2 **D** 3

2. $\begin{vmatrix} x & 4 \\ -3 & x \end{vmatrix} = \begin{vmatrix} 5 & 0 \\ -1 & 4 \end{vmatrix}$ *then value of* x. 1

A ± 20 **B** $\pm 4\sqrt{2}$ **C** $\pm 2\sqrt{2}$ **D** ± 4

3. $If\ A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 3 \\ -1 & 0 & 3 \end{pmatrix}, |A.adjA| =$ ___ 1

A 1 **B** 3 **C** 9 **D** 27

4. *Which of the following function is one to one and onto?* 1

A $f(x) = 2x + 3, f: R\ to\ R$ *B* $g(x) = x^3, f: Z\ to\ Z$

C $h(x) = sinx, f: R\ to\ R$ D $p(x) = |x|, f: R\ to\ R$

5. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$ then A^{-1} 1

A $\begin{bmatrix} 4 & 5 \\ 2 & 3 \end{bmatrix}$ **B** $\begin{bmatrix} -2 & 2 \\ 1 & -3 \end{bmatrix}$ **C** $\begin{bmatrix} 2 & -\frac{5}{2} \\ -1 & \frac{3}{2} \end{bmatrix}$ **D** $\begin{bmatrix} 2 & \frac{5}{2} \\ 1 & \frac{3}{2} \end{bmatrix}$

6. The domain of the function $sin^{-1}(2x-1)$ 1

A [-1, 1] **B** [0, 1] **C** (-1, 1) **D** $[0, \frac{1}{2}]$

7. The value of x if $A\ is\ a\ singular\ matrix, where\ A = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & -3 \\ x & 3 & 0 \end{pmatrix}$: 1

A 3 **B** 2 **C** 1 **D** 0

8. $\sin^{-1}\left(sin\frac{5\pi}{2}\right) + \cos^{-1}(\cos 3\pi) =$_____ 1

A $-\frac{\pi}{2}$ **B** $\frac{3\pi}{2}$ **C** $\frac{\pi}{2}$ **D** π

9. If $y = \log(\log(x^5))\ then\ \frac{dy}{dx}$ 1

A $\frac{x^5}{logx^5}$ **B** $\frac{x}{logx^5}$ **C** $\frac{5}{xlogx^5}$ **D** $\frac{5}{x^5 logx^5}$

10. If x= $\sqrt{a^{sin^{-1}t}}$ $and\ y = \sqrt{a^{cos^{-1}t}}\ then\ \frac{dy}{dx}\ is\ equal\ to$: 1

A $\frac{y}{x}$ **B** $-\frac{y}{x}$ **C** $\frac{x}{y}$ **D** $-\frac{x}{y}$

11. $\int_{-\pi}^{\pi}(x^3 + xcos^3x + tanx + 1)\,dx$= _____ 1

A 0 **B** $\frac{\pi}{2}$ **C** π **D** 2π

12. If $y = tan^{-1}\left(\frac{cosx}{1-sinx}\right), then\ \frac{dy}{dx} =$ _____

A 0 **B** π **C** -1 **D** $\frac{\pi}{4}$

13. In which of the following interval $y = x^3 - 3x\ is\ strictly\ decreasing$?

A $(-\infty, 1)$ **B** (-1, 1) **C** $(1, \infty)$ **D** $(-1, \infty)$

14. The maximum value of $|1 + cos3x| =$ _____ 1

A 0 **B** 1 **C** 2 **D** 3

15. The length x of a rectangle is decreasing at the rate of 3 cm/minute and the width y is increasing at the rate of 2cm/minute. When x =10cm and y = 6cm, the rates of change of the area of the rectangle is: 1

A $1cm^2/min$ **B** $-1cm^2/min$ **C** $-2cm^2/min$ **D** $2cm^2/min$

16. $f(x) = \frac{logx}{x}$ *has a stationary point at* 1

A $x = e$ B x=1 C $x = \frac{1}{e}$ D $x = 0$

17. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{cosx}{1+5^x} dx$: 1

A 2 **B** 1 **C** 0 **D** -1

18. $\int \frac{1}{x + xlogx} dx =$ 1

A $1 + logx + c$ **B** $xlogx + c$ **C** $logx + x + c$ **D** $log(1 + logx) + C$

ASSERTION-REASON BASED QUESTIONS

In the following questions (19 and 20), a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

19. (A)Every scalar matrix is a diagonal matrix
(R) In a diagonal matrix all diagonal elements are 0. 1

A B C D

20. *A)* $f(x) = x^2 + 1$ *is increasing in* R
R) f(x) is increasing if $f'(x) \geq 0, x \in R$ 1

A B C D

SECTION B

21. a) Show that $f(x) = Sinx, f: R\ to\ R$ is neither one to one nor onto. 2

OR

b) Evaluate: $tan^{-1}(-1) + cot^{-1}\left(-\sqrt{3}\right) + cos^{-1}(-\frac{1}{2})$

22. Find $\frac{dy}{dx}\ if\ x^2 + 3xy + y^2 = 10$. OR 2

If $y = cost + logtan\frac{t}{2}$, $x = sint$, show that $\frac{dy}{dx}$ =tant

23. Evaluate: $\int e^x \left(\frac{x-3}{(x-1)^3}\right) dx$ 2

24. Simplify: $tan^{-1}\left(\frac{cosx}{31-sinx}\right)$ 2

25. Write $a\ 2 \times 2\ matrix\ if\ A = \left[a_{ij}\right]\ and\ a_{ij} = \frac{2i-j}{2}$. 2

SECTION C

26. a) Evaluate using properties of integrals: $\int_{-1}^{1} \frac{x^3+|x|+1}{x^2+2|x|+1} dx$ OR 3

b) Evaluate using properties of integrals: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}1} \frac{1}{1+\sqrt{tanx}} dx$

27. If $f(x) = 9x^2 + 6x - 1$, $f: N\ to\ range\ of\ f$, then show that f is one to one. Also evaluate x if f(x)= 14. 3

28. Find the derivative of $x^x + (x)^{logx}$ with respect to x 3

29. Express $A = \begin{pmatrix} 4 & 0 & 1 \\ 2 & 1 & 3 \\ -1 & 2 & 6 \end{pmatrix}$ as the sum of a symmetric and a skew symmetric matrix. 3

30. Find the intervals in which the function $f(x) = sinx + cosx$, $x \in [0, 2\pi]$ 3

31. Evaluate: $\int \frac{cosx}{(1+sinx)(2+sinx)} dx$ 3

SECTION D

32. Given: $A = \{1, 2, 3, 4, \ldots, 10\}$.Prove that the relation R on the set AXA defined by $(a, b)R(c, d),\ iff\ ad = bc,$ $\forall\ (a, b), (c, d) \epsilon AXA\ is\ an\ equivalence\ relation.$ 5

33. $If\ x^m y^n = (x + y)^{m+n}\ then\ prove\ that\ \frac{dy}{dx} = \frac{y}{x}\ and\ \ \frac{d^2y}{dx^2} = 0$ 5

OR

$If\ x\sqrt{1+y} + y\sqrt{1+x} = 0\ then\ prove\ that$

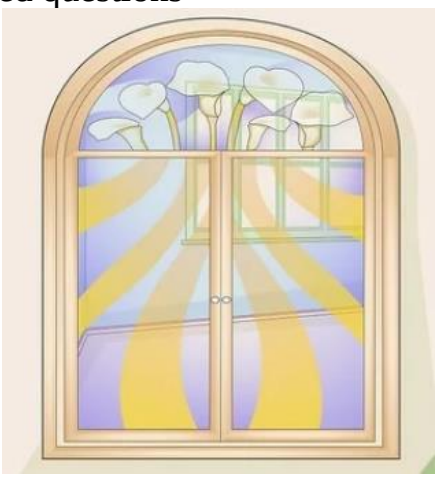
$(1 + x)^2 \frac{d^2y}{dx^2} + 2(1 + x)\frac{dy}{dx} = 0.$

34. Solve using matrices: $2x + y + z = 4,\ x + y + z = 2\ ,\ x + 2y - z = 5$ 5

35. a) Evaluate: $\int_0^{\pi} \frac{xtanx}{secx+tanx} dx$ $\quad OR \quad$ $b)$ $\int_1^2 \frac{5x^2}{x^2+4x+3} dx$ 5

SECTION E- Case study-based questions

36. A window is to be made with certain information to get maximum air and light through it. Window is in the form of a rectangle surmounted by a semi-circular opening. Total perimeter of the window is 10m. 4



Based on the above information answer the following:

Let A be the area of the window, x be the width of rectangular part and r be the radius of the semicircle.

a) Find the critical point of A.

b) Find the dimensions of the window to admit maximum light.

37. Profit function of a company is given by $p(x) = 41 + 72x - 18x^2$ 4

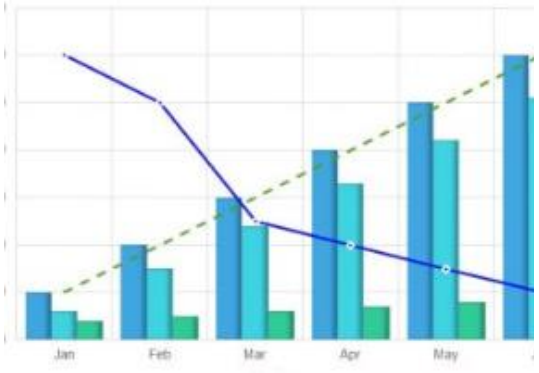
i) Find the profit when x= 1.

ii) In which interval p(x) is strictly increasing?

iii) a)Find the maximum profit?

OR

b)Find the absolute minimum value of p(x) in [0, 3]



38. In an election, a political group hired a public relation firm to promote their candidate in three ways: telephone, house calls and letters. The cost per contact is given as follows:
Telephone ₹ 0.10, House call ₹ 1.00 and letter ₹ 2.00.
If the number of contacts made in two cities X and Y are given below:

4

City	Telephone	House call	Letter
X	1000	500	5000
Y	3000	1000	10,000

a) $If\ A\ is\ a\ 2 \times 3\ matrix\ and\ B\ is\ a\ 3 \times 1,$ what is the order of matrix AB?

b) What is the total amount spent on telephone calls by the political group in both the cities together?

c) Using matrices find the total amount spent in each cities X and Y.

OR

Find P if $P\begin{bmatrix}1 & -1\\ 2 & 1\end{bmatrix} = \begin{bmatrix}5 & 1\\ 6 & 3\end{bmatrix}$.

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Answers Key

Q1	B	Q2	C	Q3	D	Q4	A	Q5	C
Q6	B	Q7	A	Q8	B	Q9	C	Q10	B
Q11	D	Q12	C	Q13	B	Q14	C	Q15	D
Q16	A	Q17	B	Q18	D	Q19	C	Q20	D
Q21	$b)\ \frac{5\pi}{4}$	Q22	$\frac{dy}{dx} = -\frac{2x+3y}{3x+2y}$			Q23	$e^x\left(\frac{1}{(x-1)^2}\right)+C$		
Q24	$\frac{\pi}{4}+\frac{x}{2}$	Q25	$\begin{pmatrix} \frac{1}{2} & 0 \\ \frac{3}{2} & 1 \end{pmatrix}$			Q26	a) 2log2 b) $\frac{\pi}{12}$		
Q27	x= 1	Q28	$x^x(1+logx)+2logx.(x)^{logx-1}$						
Q29	$\begin{pmatrix} 4 & 1 & 0 \\ 1 & 1 & \frac{5}{2} \\ 0 & \frac{5}{2} & 6 \end{pmatrix} + \begin{pmatrix} 0 & -1 & 1 \\ 1 & 0 & \frac{1}{2} \\ -1 & -\frac{1}{2} & 0 \end{pmatrix}$			Q30	Strictly increasing: $\left(0, \frac{\pi}{4}\right) \cup \left(\frac{5\pi}{4}, 2\pi\right)$ Strictly decreasing: $(\frac{\pi}{4}, \frac{5\pi}{4})$			
Q31	$log\left\|\frac{1+sinx}{2+sinx}\right\|+C$			Q34	$x=2$ $y=1$ $z=-1$	Q35	a) $\frac{\pi}{2}(\pi-2)$ b) $5-\frac{45}{2}\log\frac{5}{4}+\frac{5}{2}\log\frac{3}{2}$		
Q36	length 20 / (π + 4) m and breadth 10 / (π + 4) m					Q37	i) 95 ii) $(-\infty, 2)$ iii) $a)\ 113$ b)41		
Q38	i) 2×1 ii) ₹400 iii) a. ₹ 10600 and ₹21300 b. $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$								