INDIAN SCHOOL SOHAR **SET I**

UNIT TEST- I (2024-25)

MATHEMATICS (CODE -041)

CLASS: XII **MAX. MARKS: 20**

DATE:20/05/2024 **TIME: 40 MINUTES**

General Instructions:

1. This Question paper contains - four sections A, B, C and D. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 4 MCQ's and 1 Assertion-Reason based questions of 1 mark each.
3. Section B has 2 Very Short Answer (VSA)-type questions of 2 mark each.
4. Section C has 2 Short Answer (SA)-type questions of 3 mark each.
5. Section D has 1 Long Answer (LA)-type questions of 5 marks.

	SECTION – A (Multiple Choice Questions) Each question carries 1 mark	
1.	The function $f: R \to R$ defined by $f(x) = 4 + 3\cos x$ is (a) bijective (b) many one and onto (c) one-one and into (d) neither one-one nor onto **OR** R is a relation on the set **Z** of integers and given by $(x, y) \in \boldsymbol{R} \Leftrightarrow \lvert \boldsymbol{x - y} \rvert \leq 1$. Then, R is (a) reflexive and Transitive (b) reflexive and symmetric (c) symmetric and Transitive (d) an equivalence relation	**Marks** **1**
2.	The value of the expression $2\,\text{cosec}^{-1}\frac{2}{\sqrt{3}} + \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ (a) $\frac{5\pi}{6}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d) 0	1
3.	Differential coefficient of $sin^2(x^3)$ (a) 1 (b) 6 (c) -1 (d) -6	1
4.	If A and B are skew-symmetric matrices of same order, then AB is symmetric, if (a) AB= O (b) AB = − AB (c) AB = BA (d) BA = O	1
5.	**Assertion (A):** If A is an invertible square matrix, then A^T is invertible. **Reason (R)**: Inverse of invertible symmetic matrix is a symmetric matrix. Select the correct answer from the codes (a), (b), (c) and (d) as given below (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true and but R is not the correct explanation of A (c) A is true and R is false. (d) A is false and R is true.	**1**
	SECTION – B [This section comprises of very short answer type questions (VSA) of 2 marks each]	
6.	Solve for x: $\sin^{-1} 4x + \sin^{-1} 3x = -\frac{\pi}{2}$ **OR** Show that : $tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right) = \frac{4-\sqrt{7}}{3}$	2

7.	For the following matrices A and B, $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}$, $B = [-1 \quad 2 \quad 1]$, check whether the $(AB)'$ is equal to $B'A'$ or not ?	2
	SECTION – C [This section comprises of short answer type questions (SA) of 3 marks each]	
8.	Let $f: R - \left\{-\frac{4}{3}\right\} \to R$ be a function defined as $f(x) = \frac{4x}{3x+4}$. Show that *f* is one-one function. Also, check whether *f* is an onto function or not.	3
9.	Find 'p' and 'q', if the function given by $f(x) = \begin{cases} \frac{\sin(p+1)x + 2\sin x}{x}, & if\ x < 0 \\ 2, & if\ \ x = 0 \\ \frac{\sqrt{1+qx}-1}{x}, & if\ x > 0 \end{cases}$ is continuous at x= 0. **OR** (i) $\cos(\sin x^4)$ (ii) $x^2 cosec(cot\sqrt{2x})$	3 1+2
	SECTION – D [This section comprises of long answer type question (LA) of 5 marks]	
10.	Using matrices, solve he following system of equations: $\boldsymbol{4x + 3y + 2z = 60}$, $\boldsymbol{x + 2y + 3z = 45}$, $\boldsymbol{6x + 2y + 3z = 70}$ **OR** Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations: $\boldsymbol{x - y + 2z = 1}$, $\boldsymbol{2y - 3z = 1}$, $\boldsymbol{3x - 2y + 4z = 2}$	5

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INDIAN SCHOOL SOHAR **SET I**

UNIT TESTI (2024-25)

CLASS- XII MATHEMATICS

SCORING KEY

1)	(d) **OR** (b)	1
2)	(c)	1
3)	(b)	1
4)	(c)	1
5)	(b)	1+1
6)	$\sin^{-1}4x = -\frac{\pi}{2} - \sin^{-1}3x \implies 4x = -\sin\left(\frac{\pi}{2} + \sin^{-1}3x\right) \Rightarrow -\cos(\sin^{-1}3x)$ $\Rightarrow -4x = \sqrt{1-9x^2} \Rightarrow x = \pm\frac{1}{5}$ Assin$^{-1}4x + \sin^{-1}3x < 0$ So Ans: $x = \frac{-1}{5}$ **OR** Proper steps	2
7)	Proper steps	2
8)	Proper steps to show one -one but not on-to	3
9)	Since continuous at x=0 , then $f(0) = 2$, LHL: $\lim_{x\to0^-}\frac{\sin(p+1)x + 2\sin x}{x} \Rightarrow \lim_{(p+1)\to0^-}\frac{\sin(p+1)x}{(p+1)x}\times(p+1) + 2\lim_{x\to0^-}\frac{\sin x}{x} \Rightarrow p+3$ RHL: $\lim_{x\to0^+}\frac{\sqrt{1+qx}-1}{x} \Rightarrow \lim_{x\to0^+}\frac{\sqrt{1+qx}-1}{x}\times\frac{\sqrt{1+qx}+1}{\sqrt{1+qx}+1} \Rightarrow \lim_{x\to0^+}\frac{1+qx-1}{x\,(\sqrt{1+qx}+1)} \Rightarrow \lim_{x\to0^+}\frac{q}{(\sqrt{1+qx}+1)}$ $\Rightarrow \frac{q}{2}$ Now on solving **p = − 1 and q = 4** **OR** **(i)** $-4x^3\sin(\sin^4x)\cos x^4$ **(ii)** $2x.cosec\left(cot\sqrt{2x}\right) - x^2\frac{1}{\sqrt{2x}}cosec\left(cot\sqrt{2x}\right)\cot\left(cot\sqrt{2x}\right).cosec^2\sqrt{2x}$	3 1 2
10	**|A|** = 4(6–6) -3(3 – 18)+2 (2 – 12) =25 Using equation $A = \begin{bmatrix}4&3&2\\1&2&3\\6&2&3\end{bmatrix}$, $X = \begin{bmatrix}x\\y\\z\end{bmatrix}$, $and\ B = \begin{bmatrix}60\\45\\70\end{bmatrix}$ adj A= $\begin{bmatrix}-0&-5&5\\15&0&-10\\-10&10&5\end{bmatrix}$ $\therefore\ A^{-1} = \frac{1}{25}\begin{bmatrix}-0&-5&5\\15&0&-10\\-10&10&5\end{bmatrix}$ now using $X = A^{-1}B$ then $\Rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix} = \frac{1}{25}\begin{bmatrix}-0&-5&5\\15&0&-10\\-10&10&5\end{bmatrix}\begin{bmatrix}60\\45\\70\end{bmatrix} \Rightarrow \frac{1}{5}\begin{bmatrix}-0&-1&1\\3&0&-2\\-2&2&1\end{bmatrix}\begin{bmatrix}60\\45\\70\end{bmatrix} \begin{bmatrix}x\\y\\z\end{bmatrix} = \frac{1}{5}\begin{bmatrix}0-45+70\\180+0-140\\120+90+70\end{bmatrix} \Rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix} = \frac{1}{5}\begin{bmatrix}25\\40\\40\end{bmatrix}$ **ANS : x = 5, y = 8, z = 8** **OR** using equations : $A = \begin{bmatrix}1&-1&2\\0&2&-3\\3&-2&4\end{bmatrix}, X = \begin{bmatrix}x\\y\\z\end{bmatrix}, B = \begin{bmatrix}1\\1\\2\end{bmatrix} \Rightarrow X = A^{-1}B$ Let $C = \begin{bmatrix}-2&0&1\\9&2&-3\\6&1&-2\end{bmatrix}$ then $AC = \begin{bmatrix}1&-1&2\\0&2&-3\\3&-2&4\end{bmatrix}\begin{bmatrix}-2&0&1\\9&2&-3\\6&1&-2\end{bmatrix} = \begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix} \Rightarrow AC = I$ $\Rightarrow A^{-1}(AC) = A^{-1}I \Rightarrow IC = A^{-1} \Rightarrow A^{-1} = \begin{bmatrix}-2&0&1\\9&2&-3\\6&1&-2\end{bmatrix}$ Now $X = A^{-1}B \Rightarrow, \begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}1&-1&2\\0&2&-3\\3&-2&4\end{bmatrix}\begin{bmatrix}1\\1\\2\end{bmatrix} \Rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}-2+0+2\\9+2-6\\6+1-4\end{bmatrix} \Rightarrow \begin{bmatrix}x\\y\\z\end{bmatrix} = \begin{bmatrix}0\\5\\3\end{bmatrix}$ **ANS : x = 0, y =5, z = 3**	5

INDIAN SCHOOL SOHAR

PERIODIC TEST/ UNIT TESTI (2024-25)

MATHEMATICS - CLASS- XII

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S.NO.	CHAPTER	1 MARK	2 MARKS	3 MARKS	5 MARKS	TOTAL=20
1.	REALTION & FUNCTION	1	-	1	--	4
2.	INVERSE TRIGONOMETRIC FUNCTION	1	1*	--	--	3
3.	MATRICES	1	1	--	--	3
4.	DETERMINANTS	1 (AR)	--	--	1*	6
5.	Continuity & Differentiability (exercises 5.1 & 5.2)	1	--	1*		4