

**Pre Board
MT -01**



12th

Syllabus: Mock Test 01 : Ch – Relations and Function, Inverse Trigonometry, Matrices & Determinants

Time: 90 min

Maximum marks :40

INSTRUCTIONS TO THE STUDENTS

1. Read each question carefully .
2. Mark of each question is mention in front of question .
3. Attempt one question in internal choice based question .
4. Use of calculators is not allowed.
5. No negative marking .

SECTION A

(Questions 1 – 10 carry 1 marks)

1	The value of expression $\sec^{-1}(2) + \sin^{-1}\left(\frac{1}{2}\right) + \tan^{-1}(-\sqrt{3})$ is : (a) $\frac{5\pi}{3}$ (b) $\frac{\pi}{3}$ (c) $\frac{-\pi}{3}$ (d) $\frac{\pi}{6}$	1
2	Given that A is a non- singular matrix of order 3 , such that $A^2 = 2A$, then value of $ 2A $ is : (a) 4 (b) 8 (c) 64 (d) 16	1
3	The principal value of $\cos^{-1}\left(\cos \frac{13\pi}{6}\right)$ is (a) $\frac{13\pi}{6}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$	1
4	Let $X = \{x^2 : x \in \mathbb{N}\}$ and the function $f : \mathbb{N} \rightarrow X$ is defined by $f(x) = x^2$, $x \in \mathbb{N}$. This function is : (a) injective only (b) not bijective (c) surjective (d) bijective	1
5	The number of onto mapping from the set $A = \{1, 2, \dots, 100\}$ to set $B = \{1, 2\}$ is ... (a) $2^{100} - 2$ (b) 2^{100} (c) $2^{99} - 2$ (d) 2^{99}	1
6	Given that $A = [a_{ij}]$ is a square matrix of order 3×3 and $ A = -7$ then the value of $\sum_{i=1}^3 a_{i2} A_{i2}$, where A_{ij} denotes the cofactor of elements a_{ij} is : (a) 7 (b) -7 (c) 0 (d) 49	1
7	If $\cos^{-1} \alpha + \cos^{-1} \beta + \cos^{-1} \gamma = 3\pi$, then the value of $\alpha + \beta + \gamma$ is : (a) 0 (b) 3 (c) -3 (d) 6	1
8	For any square matrix A, $(A - A^t)^t$ is always : (a) An identity matrix (b) A null matrix (c) A skew symmetric matrix (d) A symmetric matrix	1
9	If $A \cdot (\text{adj } A) = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then the value of $ A \cdot \text{adj } A $ is equal to : (a) 12 (b) 9 (c) 3 (d) 27	1
10	Two statements are given, one labelled Assertion (A) and the other labelled Reason(R) Select the correct answer from the options (A), (B), (C) and (D) as given below .	1

- (a) Both A and R are true and R is the correct explanation for A.
 (b) Both A and R are true and R is not the correct explanation for A.
 (c) A is true but R is false.
 (d) A is false but R is true
- Assertion (A):** Domain of $f(x) = \sin^{-1}x + \cos x$ is $[-1, 1]$.
Reason (R): Domain of a function is the set of all possible values for which function will be defined.

SECTION B

(Questions 11 – 13 carry 2 marks)

- 11** (a) Find the value of $\tan \left[\frac{\pi}{4} + \cos^{-1} \left(\frac{4}{5} \right) \right]$
 OR
 (b) If $\tan^{-1} y + \tan^{-1} z = \frac{\pi}{4}$, then find the value of $y+z+yz$. **2**
- 12** Find the values of x, y and z if the matrix $A^T = \begin{bmatrix} 0 & x & x \\ 2y & y & -y \\ z & -z & z \end{bmatrix}$ satisfy the equation $A^T A = I$. **2**
- 13** Show that the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{x}{x^2+1}$ is neither one nor onto. **2**

SECTION C

(Questions 14 – 15 carry 3 marks)

- 14** (a) Find matrix A if $A \cdot \begin{bmatrix} 1 & -2 & 5 \\ 4 & -3 & 9 \end{bmatrix} = \begin{bmatrix} 14 & -13 & 37 \end{bmatrix}$
 Or
 (b) Let $A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}$, where $0 \leq \theta \leq 2\pi$ then find the range of $\text{Det}(A)$ **3**
- 15** Find the domain of the function $y = \sin^{-1}(x^2-2)$ **3**

SECTION D

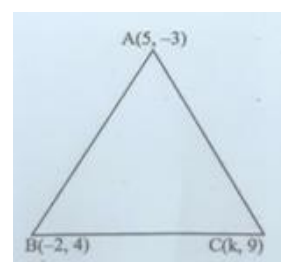
(Questions 16 – 17 carry 5 marks)

- 16** (a) If $A = \{x \in \mathbb{Z} : 0 \leq x \leq 15\}$. Show that $R = \{(a, b) : a, b \in A, |a - b| \text{ is divisible by } 5\}$ is an equivalence relation. Find the set of all elements related to 1.
 OR
 (b) Let $\mathbf{N}$ denote the set of all natural numbers and R be the relation on $\mathbf{N} \times \mathbf{N}$ defined by $(a, b)R(c, d)$ if $ad(b+c) = bc(a+d)$. Show that R is an equivalence relation. **5**
- 17** Evaluate the product AB, where
 $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$,
 Hence solve the system of linear equations:
 $x - y = 3$, $2x + 3y + 4z = 17$, $y + 2z = 7$ **5**

SECTION E

(Questions 18 – 19 carry 4 marks)

- 18** Sushant is a farmer . He has a triangular field as shown in figure . The vertices of triangular field are $A(5, -3)$, $B(-2, 4)$ and $C(k, 9)$ where $k < -5$.
 Based on the above information answer the following question :
 (i) If area of the triangular field is 14 square units, then find the value of k using determinant.
 (ii) Using this value of k, find the value of $a+b+c$ **4**



	If $\begin{bmatrix} k+a & 0 & 0 \\ 0 & k+2b & 0 \\ 0 & 0 & k+3c \end{bmatrix}$ is identity matrix.	
19	An architect is designing a commercial complex and its working on the layout of a rectangular plot of land . When asked about the dimensions. He provides the following instructions : • If the length of the plot is decreased by 25m and the breadth is increased by 25 m, the area is increased by 625 m². • If the length of the plot is decreased by 20m and the breadth is increased by 10m, the area is decreased by 200m². Let the original length be x metres and the breadth be y meters. Based on the above information, answer the following : (i)Formulate the system of linear equation in x and y representing the given conditions. (ii)Solve the system of equations using matrix method to find the dimensions of the plot.	4

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