Pre Board MT -03

INFINITY THINK BEYOND.....

AN EDUCATIONAL INSTITUTE

12 th

Syllabus: Mock Test 03 : Ch – Relation & Function, Inverse Trigonometric Functions , Matrices, Determina Continuity & Differentiability & Application Of Derivatives (Book 1)

Time: 90 min **Maximum marks :40**

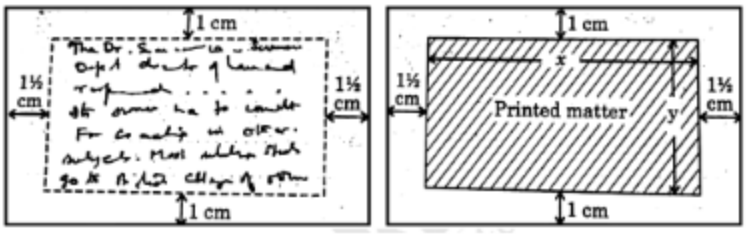
INSTRUCTIONS TO THE STUDENTS

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	If A = $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then (a) $1 + \alpha^2 + \beta\gamma = 0$ (b) $1 - \alpha^2 + \beta\gamma = 0$ (c) $1 - \alpha^2 - \beta\gamma = 0$ (d) $1 + \alpha^2 - \beta\gamma = 0$	**1**
2	If the matrix $\begin{bmatrix} 3 & 2a & -5 \\ -4 & 0 & b \\ -5 & 3 & 7 \end{bmatrix}$ is symmetric, then the value of (a +b) is (a) 0 (b)1 (c) 2 (d) 3.	**1**
3	The principal value of $\sin^{-1}\left(\cos\frac{3\pi}{5}\right)$ is (a) $\frac{\pi}{10}$ (b) $\frac{3\pi}{5}$ (c) $-\frac{\pi}{10}$ (d) $-\frac{3\pi}{5}$	**1**
4	If $f(x)=\begin{cases} \frac{\sqrt{4+x}-2}{x} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at x = 0, then the value of k is (a)1 (b)4 (c) $\frac{1}{4}$ (d)0	**1**
5	The interval in which the function $f(x) = 2x^3 + 3x^2 - 12x + 1$ is increasing (a) [-2, 1] (b) $(-\infty, -2] \cup [1, \infty)$ (c)) $(-\infty, 1]$ (d) $(-\infty, -1] \cup [2, \infty)$	**1**
6	The domain of the function $\cos^{-1}\sqrt{1-x}$ is (a) [-1,1] (b) $(-\infty, 1]$ (c) [0, 1] (d) none of these	**1**
7	If $x=t^2$ and $y=t^3$, then $\frac{d^2y}{dx^2}$ is equal to (a) $\frac{3}{2}$ (b) $\frac{3}{2}t$ (c) $\frac{3}{2t}$ (d) $\frac{3}{4t}$	**1**
8	The derivate of $\tan^{-1}\left(\frac{3x-4x^3}{1-3x^2}\right)$ w.r.t.x is (a) $\frac{1}{1+x^2}$ (b) $\frac{3}{1+9x^2}$ (c) $\frac{3}{1+x^2}$ (d) $3\sec^2 3x$	**1**
9	If R is relation on Z (set of all integers) defined by x R y if and only if $\lvert x - y \rvert \leq 1$, then R is (a) reflexive and symmetric (b) reflexive and transitive (c) symmetric and transitive (d) an equivalence relation	**1**
10	Two statements are given, one lablled Assertion (A) and the other labelled Reason(R) Select the correct answer from the options (A), (B), (C) and (D) as given below . (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.	**1**

	(c) A is true but R is false. (d) A is false but R is true **Assertion(A)**: The domain of the function $\sin^{-1}(2x-1)$ is (0,1] **Reason (R):** The domain of the function $\sin^{-1} x$ is [-1, 1].	
	SECTION B **(Questions 11 – 13 carry 2 marks)**	
11	Find the intervals in which $f(x) = 20-9x+6x^2-x^3$ is strictly increasing.	**2**
12	(a)Prove that the diagonal elements of skew symmetric matrix area all zero **OR** (b)Prove that every square matrix can be expressed as sum of symmetric and skew symmetric matrix.	**2**
13	If $x^y = e^{x-y}$, prove that $\frac{dy}{dx}=\frac{\log x}{(1+\log x)^2}$	**2**
	SECTION C **(Questions 14 – 16 carry 3 marks)**	
14	Differentiate $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ with respect to $\cos^{-1}(2x\sqrt{1-x^2})$, when $x\neq 0$. **OR** If $x = a(\theta - \sin\theta), y = a(1-\cos\theta)$ Find $\frac{d^2y}{dx^2}$.	**3**
15	Determine whether the function f(x) defined on R of $f(x)=x+\lvert x\rvert$ is an onto function or not? Justify.	**3**
	SECTION D **(Questions 18 – 19 carry 5 marks)**	
16	Show that the semi –vertical angle of a cone of maximum volume and given slant height is $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ Or Find the local maximum or minimum, if any of the function f(x) = sinx - cosx $0<X<2\pi$, Also, find the local extrema values.	**5**
17	If $A=\begin{bmatrix}1 & 2 & -3\\ 2 & 0 & -3\\ 1 & 2 & 0\end{bmatrix}$, then find $A^{-1}$and hence solve the following system of equation: x+2y-3z=1 , 2x-3z=2 , x+2y=3	**5**
	SECTION E **(Questions 19 – 20 carry 4 marks)**	
18	A rectangular visiting card is contains 24sq.cm of printed matter The margins at the top and bottom of the card are to be 1 cm the margins on the left and right are to be 1.5cm as shown below.  On the basis of given information, answer the following questions. (i)Write the expression for the area of the visiting card in terms of x. (ii)Obtain the dimensions of the card of minimum area.	**2** **2**
19	Students of a school are taken to a railway museum to learn about railways heritage and its history	

An exhibit in the museum depicted many rail lines on the track near the railway station. Let L be the set of all rail lines on the railway track and R be the relation on I defined by

$R = \{(l_1, l_2): l_1 \text{ is parallel to } l_2\}$.

On the basis of the above information, answer the following questions.

(i) Find whether the relation R is symmetric or not. **1**

(ii) Find whether the relation R is transitive or not **1**

(iii) If one of the rail lines on the railway track is represented by the equation $y = 3x + 2$, then find the set of rail lines in R related to it. **2**

Or

(iii) Let S be the relation defined by $S = \{(l_1, l_2): l_1 \text{ is perpendicular to } l_2\}$, check whether the relation S is symmetric and transitive **2**