PREVIOUS YEAR QUESTIONS

FOR CLASS-12

MATHEMATICS

$[0\ to\ \infty)$

HOLIDAY HHW

SUMMER VACATION

24-25

Chapter 1. Relations and Functions

<u>One mark Questions</u>

1. State the reason for the relation R in the set {1,2,3} given by R={(1,2),(2,1)} not to be transitive. **(2011)**

2. A relation R in a set A is called___________, if $(a_1, a_2) \in R$ implies $(a_2, a_1) \in R$, for all $a_1, a_2 \in A$. **(2020)**

Ans: symmetric

<u>Four marks Questions</u>

1. Show that f: $N \to N$, given by $f(x) = 1 \begin{matrix} x+1\text{ , if } x \text{ is odd} \\ x-1\text{ , if } x \text{ is even} \end{matrix}$ is both one-one and onto. **(2012)**

2. Show that the function f in $A = R - ;\frac{2}{3}<$ defined as $f(x) = \frac{\$x\&3}{6x(\$}$ is one-one and onto. **(2013)**

3. Let A={1,2,3,...9} and R be the relation in A×A defined by $(a, b)R(c, d)$ if $a + d = b + c$ for (a, b), (c, d) in $A \times A$. Prove that R is an equivalence relation and also obtain the equivalent class [(2, 5)]. **(2014)**

4. Show that the relation R on R defined as $R = \{(a, b) : a \leq b\}$, is reflexive, and transitive but not symmetric. **(2019)**

Or

Prove that the function $f : N \to N$, defined by $f(x) = x^2 + x + 1$ is one-one but not onto. **(2019)**

5. Let N be the set of natural numbers and R be the relation on N × N defined by $(a, b)\ R\ (c, d)\ iff\ ad = bc$ for all $a, b, c, d \in N$. Show that R is an equivalence relation. **(2020)**

<u>Five marks Questions</u>

1. A function $f: [-4,4] \to [0,4]$ is given by $f(x) = \sqrt{16 - x^2}$. Show that f is an onto function but not a one-one function. Further, find all possible values of $'a'$ for which $f(a) = \sqrt{7}$. **(2023)**

Ans: $a = \pm 3$

<u>Six marks Questions</u>

2. Let N denote the set of all natural numbers and R be the relation on N × N defined by (a, b) R (c, d) if ad(b + c) = bc(a + d). Show that R is an equivalence relation. **(2015)**

3. Show that the relation R on the set Z of all integers defined by $(x, y) \in R \Leftrightarrow (x - y)$ is divisible by 3 is an equivalence relation. **(2018-C)**

Chapter 2. Inverse Trigonometric Functions

One-mark Questions

1. Write the value of $\tan^{-1}\left[\tan\frac{3\pi}{4}\right]$. **(2011)**

2. Find the principal value of $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ **(2012)**

3. Write the value of $\tan\left(2\tan^{-1}\frac{1}{5}\right)$. **(2013)**

4. Write the principal value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right)$. **(2013)**

5. If $sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then find the value of x. **(2014)**

6. Find the value of $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$. **(2018-C)**

Ans: $-\frac{\pi}{3}$

7. The principal value of $\tan^{-1}\left(\tan\frac{3\pi}{5}\right)$ is **(2020)**

(A) $\frac{2\pi}{5}$ (B) $-\frac{2\pi}{5}$ (C) $\frac{3\pi}{5}$ (D) $-\frac{3\pi}{5}$

8. Assertion(A): Maximum value of $(\cos^{-1}x)^2$ is π^2. **(2023)**

Reason(R): Range of the principal value branch of $cos^{-1}x$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.

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 and (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

Two marks Questions

1. Prove that $3\cos^{-1}x = \cos^{-1}(4x^3 - 3x), x \in \left[\frac{1}{2}, 1\right]$. **(2018-C)**

2. Prove that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\cos^{-1}x, \frac{1}{\sqrt{2}} \le x \le 1$. **(2020)**

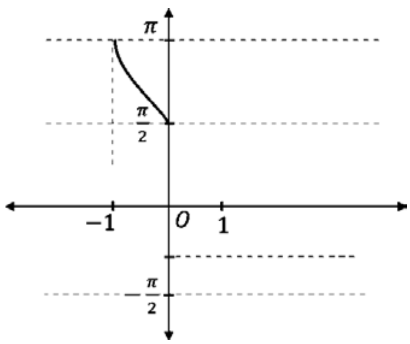
3. (a) Evaluate $\sin^{(1} \mathrm{Z}\sin \frac{3\pi}{\$}[+ \cos^{(1}(\cos\pi) + \tan^{(1}(1)$. **(2023)**

Ans: $\frac{3\pi}{2}$

Or

(b) Draw the graph of $\cos^{(1} x$, where $x \in [-1,0]$. Also, write its range. **(2023)**

Ans: $\mathrm{T}\frac{\pi}{2}, \pi\mathrm{U}$



Four marks Questions

1. $\cot^{(1} \mathrm{Z}\frac{\sqrt{1\&\sin x}\&\sqrt{1(\sin x}}{\sqrt{1\&\sin x}(\sqrt{1(\sin x}}[= \frac{x}{2}, \quad x \in \mathrm{Z}0, \frac{\pi}{\$}[$ **(2011,2014)**

2. Prove the following: $cos\ \mathrm{Z}\sin^{(1}\frac{3}{*} + \cot^{(1}\frac{3}{2}[= \frac{6}{*\sqrt{13}}$ **(2012)**

3. If $\sin[\cot^{(1}(x+1)] = \cos(\tan^{(1} x)$, then find x. **(2015)**

Ans: $x = -\frac{1}{2}$

Or

If $(\tan^{(1} x)^2 + (\cot^{(1} x)^2 = \frac{*\pi^2}{/}$, then find x. **(2015)**

Ans: $x = -1$

4. Prove that: $\tan^{(1}\frac{1}{*} + \tan^{(1}\frac{1}{0} + \tan^{(1}\frac{1}{3} + \tan^{(1}\frac{1}{/} = \frac{\pi}{/}$ **(2016)**

Or

Solve for x : $2\tan^{(1}(\cos x) = \tan^{(1}(2\ cosec\ x)$ **(2016)**

Ans: $x = \frac{\pi}{\$}$

5. If $tan^{-1}\frac{x-3}{x-4}+tan^{-1}\frac{x+3}{x+4}=\frac{\pi}{4}$, then find the value of x. **(2017)**

Ans: $x=\pm\frac{\sqrt{10}}{2}$

6. Solve: $\tan^{-1}4x+\tan^{-1}6x=\frac{\pi}{4}$. **(2019)**

Chapter 3. Matrices

One-mark Questions

1. For a 2×2 matrix, $A = [a_{12}]$, whose elements are given by $a_{12} = \frac{1}{2}$, write the value of a_{12}. **(2011)**

2. If $A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, then find $A^T - B^T$. **(2012)**

3. Find the value of $x + y$ from the following equation: $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$ **(2012)**

4. Find the value of a if $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$ **(2013)**

5. If $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$, then find the matrix A. **(2013)**

6. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, find $(x - y)$. **(2014)**

7. Solve the following matrix equation for x: $[x \quad 1]\begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O$. **(2014)**

8. Write the elements a_{23} of a 3×3 matrix $a = (a_{12})$ whose elements a_{12} are given by $a_{12} = \frac{|1-2|}{2}$. **(2015)**

Ans: $\frac{1}{2}$

9. If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$. **(2016)**

Ans: A

10. Matrix $A = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, find values of a and b.

(2016)

Ans: $a = -\frac{2}{3}$ and $b = \frac{3}{2}$

11. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & x \\ -2 & 2 & -1 \end{bmatrix}$ is a matrix satisfying $AA^5 = 9I$, find x. **(2018-C)**

Ans: $x = -2$

12. If A is a matrix of order 3×2, then the order of the matrix A′ is____________. **(2020)**

Ans: 2×3

Or

A square matrix A is said to be skew-symmetric, if____________. **(2020)**

Ans: $A = -A^5$

13. If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to **(2020)**

(A) I (B) 0 (C) I–A (D) I+A

14. If A is a 2×3 matrix such that AB and AB^5 both are defined, then order of the matrix B is **(2023)**

(A) 2×2 (B) 2×1 (C) 3×2 **(D) 3×3**

15. If $\begin{bmatrix} 2 & 0 \\ 5 & 4 \end{bmatrix} = P + Q$, where P is a symmetric and Q is a skew symmetric matrix, then Q is equal to **(2023)**

(A) $\begin{bmatrix} 2 & 5/2 \\ 5/2 & 4 \end{bmatrix}$ **(B)** $\begin{bmatrix} \mathbf{0} & \mathbf{-5/2} \\ \mathbf{5/2} & \mathbf{0} \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 5/2 \\ -5/2 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & -5/2 \\ 5/2 & 4 \end{bmatrix}$

Two marks Questions

1. Find the matrix A such that $2A - 3B + 5C = O$, where $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$. **(2019)**

Ans: $A = \begin{bmatrix} -8 & 3 & 5 \\ -13 & -1 & -9 \end{bmatrix}$

Four marks Questions

1. Three schools A, B and C organized a mela for collecting funds for helping the rehabilitation of flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs 25, Rs100 and Rs 50 each. The number of articles sold are given below :

Article/School	A	B	C
Hand-fans	40	25	35
Mats	50	40	50

Plates	20	30	40

Find the funds collected by each school separately by selling the above articles. Also find the total funds collected for the purpose.
Write one value generated by the above situation. **(2015)**

Ans: school A : Rs. 7000, School B : Rs. 6125, School C : Rs. 7875 ,Total collected : Rs. 21000

2. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ find $A^2 - 5A + 4I$ and hence find a matrix X such that $A^2 - 5A + 4I + X = O$ **(2015)**

Ans: $\begin{bmatrix} -1 & -1 & -3 \\ -1 & -3 & -10 \\ -5 & 4 & 2 \end{bmatrix}$, $X = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & 10 \\ 5 & -4 & -2 \end{bmatrix}$

Or

If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$, find $(A')^{-1}$ **(2015)**

Ans: $\begin{bmatrix} -9 & -8 & -2 \\ 8 & 7 & 2 \\ -5 & -4 & -1 \end{bmatrix}$

3. Find matrix A such that $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 \\ 1 & -2 \\ 9 & 22 \end{bmatrix}$ **(2017)**

Ans: $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$