FACULTY HIGHER SECONDARY SCHOOL
CLASS – XII SCI
MATHEMATICS
SAMPLE PAPER– I
SESSION 19-20

MARKS : 50

Each Question Carries 1 mark:

1. Write the value of $\text{Cos}^{-1}(-\frac{1}{2}) + 2\text{Sin}^{-1}(\frac{1}{2})$.

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

3. Find x and y if $2\begin{pmatrix}1 & 3\\ 0 & x\end{pmatrix}+\begin{pmatrix}y & 0\\ 1 & 2\end{pmatrix}=\begin{pmatrix}5 & 6\\ 1 & 8\end{pmatrix}$

4. If $x = a\,\text{Sin}^3\theta$ and $y = a\text{tan}^3\theta$. Find $\frac{dy}{d\theta}$ at $x = \frac{\pi}{3}$.

Each Question Carries 1 mark:

Choose the correct :

1. The domain of the function defined by $f(x) = \text{Sin}^{-1}\sqrt{x-1}$ is

(a) [0, 1] (b) (0, 1) (c) [1, 2] (d) (1, 2)

2. If $f : \text{R} \to \text{R}$ be given by $f(x) = (3-x^3)^{\frac{1}{3}}$ then $fof(x)$ is

(a) $x^{\frac{1}{3}}$ (b) x^3 (c) x (d) $(3 - x^3)$

3. If $\text{y} = \text{Sin}^{-1}\left(\frac{2x}{1+x^2}\right)$, then $\frac{dy}{dx}$ is

(a) $\frac{1}{1+x^2}$ (b) $\frac{-2}{1+x^2}$ (c) $\frac{-1}{1+x}$ (d) $\frac{2}{1+x^2}$

4. $f(x) = x^2$ is strictly decreasing in

(a) (0, α) (b) (0, 1) (c) (–α, 0) (d) (–1. 0)

5. If $x \in N$ and $\begin{vmatrix}x+1 & -2\\ -3x & 2x\end{vmatrix} = 8$, then the value of x is

(a) 3 (b) 2 (c) –3 (d) –5

6. If A, B are symmetric matrices of same order, then AB – BA is a

(a) Identity matrix
(b) Zero matrix
(c) Symmetric matrix
(d) Skew symmetric matrix

Each Question Carries 2 marks:

1. Express the given matrix A as the sum of symmetric and a skew symmetric matrix

$$\text{A} = \begin{bmatrix}3 & 3 & -1\\ -2 & -2 & 1\\ -4 & -5 & 2\end{bmatrix}$$

2. Prove that

$$\text{Cot}^{-1}\left(\frac{\sqrt{1+Sinx}-\sqrt{1-Sinx}}{\sqrt{1+Sinx}-\sqrt{1-Sinx}}\right) = \frac{x}{2},\ x \in \left(0, \frac{\pi}{4}\right)$$

3. Consider $f : R_+ \to [-5, \alpha)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible. Find f^{-1}.

4. Show that $\Delta = \begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix} = (x - p)(x^2 + px - 2q^2)$

5. Find the slope of the normal to the curve $x = a\,\text{Cos}^3\theta$, $y = a\,\text{Sin}^3\theta$ at $\theta = \frac{\pi}{4}$

6. Differentiate $(5x)^{3\text{Cos}2x}$ wrt x.

Each Question Carries 4 marks **:**

1. If $A = \begin{pmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{pmatrix}$, then find A^{-1}. Using A^{-1} solve the system of linear equation $x - 2y = 10$, $2x - y - z = 8$ and $-2y + z = 7$.

2. Differentiate $\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ wrt x.

3. Find the points on the curve $\frac{x^2}{4} + \frac{y^2}{25} = 1$ at which the tangents are (i) parallel to x – axis (ii) parallel to y– axis.

4. Find the value, of k for which $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & \text{if } -1 \le x < 0 \\ \frac{2x+1}{x-1}, & \text{if } 0 \le x < 0. \end{cases}$

Each Question Carries 6 marks **:**

1. Show that the surface area of a closed cuboid with square base are given volume is minimum, when it is a cube

OR

Find the minimum area of an isosceles triangle inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with its vertex at one end of the major axis.

2. The sum of three number is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

OR

Using properties of determinants. Show that

$$\begin{vmatrix} Sin\alpha & Cos\alpha & Cos(\alpha+\delta) \\ Sin\beta & Cos\beta & Cos(\beta+\delta) \\ Sin\gamma & Cos\gamma & Cos\,(\gamma+\delta) \end{vmatrix} = 0$$

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