SAMPLE PAPER - 2014
MATHEMATICS
Class – XII

MAXIMUM MARKS:100 **TIME: 3 HOURS.**

General Instructions:

- All questions are compulsory.
- The questions paper consists of 26 questions divided into three sections A,B and C. Section A comprises of 06 questions of one mark each, section B comprises of 13 questions of four marks each and section C comprises of 7 questions of six marks each.
- All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- There is no overall choice. However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION – A

1) If $\begin{pmatrix} x-y & z \\ 2x-y & w \end{pmatrix} = \begin{pmatrix} -1 & 4 \\ 0 & 5 \end{pmatrix}$, find the value of x, y, z and w.

2) If f (x) = $\frac{4x+3}{6x-4}$, find f o f (x)

3) Find the principal value of $tan^{-1}(-1)$.

4) The total revenue in Rupees received from the sale of x units of a product is given by R(x) = $3x^2$ + 36x + 5. Find the marginal revenue, when x=5, where by marginal revenue we mean the rate of change of total revenue with respect to the number of items sold at an instant.

5) Evaluate $\int e^x(\frac{1}{1+x^2} + \tan^{-1} x)dx$.

6) If A is a square matrix of order 3 such that |adj A|=36 find |A|

SECTION- B

7) Show that the relation R in set A ={ x $\in$ Z , $0 \leq x \leq 12$ } given by R = {(a,b): $|a-b|$ is a multiple of 4} is an equivalence relation.

8) Find the values of a and b such that the function defined by f (x) $\begin{cases} 5, if\ x \leq 2 \\ ax+b, if\ 2 < x < 10 \\ 21, if\ x \geq 10 \end{cases}$ is

continuous.

9) If x = a ($\cos\theta + \theta \sin\theta$) , y = a($\sin\theta - \theta \cos\theta$) find $\frac{d^2y}{dx^2}$.

10) Differentiate $sin^2\left[cot^{-1}\left(\sqrt{\frac{1+x}{1-x}}\right)\right]$ w.r.to x . OR. Differentiate $(\log x)^x + (x)^{\log x}$ w.r.t x.

11) Find a point on the curve $y = x^3 - 2x$, where the tangent is parallel to the chord joining $(1,-2) and\ (2,2)$.

12) Find the intervals in which $-2x^3 - 9x^2 - 12x + 1$ is increasing or decreasing.

13) Evaluate $\int \frac{\cos x}{(1-\sin x)(2-\sin x)} dx$ OR . Evaluate $\int \frac{e^x}{\sqrt{5-4e^x-e^{2x}}} dx$

14) Evaluate $\int \frac{dx}{\cos(x-a)\cos(x-b)} dx$

15) Solve for x, $\sin^{-1} x + \sin^{-1} 2x = \frac{\pi}{3}$

OR

$Prove\ \sin^{-1}\frac{12}{13} + \cos^{-1}\frac{4}{5} + \tan^{-1}\frac{63}{16} = \pi$

16) Find the matrix p satisfying the matrix equation

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} p \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}.$$

17) Test for bijective for that the function $f: R \to R$, given by

$$f(x) = f(x) = \begin{cases} 1 & if \quad x > 0 \\ 0, & if \quad x = 0 \\ -1 & if \quad x < 0 \end{cases}$$

OR

$f: R \to [4, \infty]$ given by $f(x) = x^2 + 4$, Show that f is invertible with the inverse $f^{-1}$of f given by $f^{-1}(y) = \sqrt{y-4}$

18) Test the differentiability $|x-3|$.

19) Find the approximate value of √(0.037) using differentiation.

SECTION – C

20) Using properties of determinants show that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ = abc + bc + ca + ab.

21) Evaluate $\int \sin^{-1}\sqrt{\frac{x}{a+x}} dx$

22) Find BA where $A=\begin{pmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{pmatrix}$, $B=\begin{pmatrix}2 & 2 & -4\\ -4 & 2 & -4\\ 2 & -1 & 5\end{pmatrix}$. Using the result

Solve: $x - y = 3$; $2x + 3y + 4z = 17$; $y + 2z = 7$.

OR

Using elementary transformation find the inverse of the matrix $\begin{bmatrix}1 & 3 & -2\\ -3 & 0 & -5\\ 2 & 5 & 0\end{bmatrix}$

23) A window is in the form of a rectangle surmounted by a semi-circular opening. The total perimeter of the window is 10m. Find the dimensions of the window to admit maximum light through the whole opening.

OR

A point on the hypotenuse of a right triangle is at a distances a and b from the sides of the triangle .Show that the minimum length of the hypotenuse is $\left(a^{\frac{2}{3}}+b^{\frac{2}{3}}\right)^{\frac{3}{2}}$.

24). $\int \frac{x^2+1}{x^4+x^2+1}\,dx$

25) It is given that for the function & given by $f(x)=x^3 + bx^2+ax$, $x\epsilon[1,3]$, Rolle's theorem hold with $C=2+\frac{1}{\sqrt{3}}$. Find the value of a & b

26) Find the equqtion of tangents to the curve $y=4x^3-2x^5$, at the point where the tangent passes through origin.

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