Sample Paper – 2014
Class – XII
Subject – MATHEMATICS

Max.Marks:100 ***Times: 3Hrs.***

General instruction:

1. ***All questions are compulsory. The question paper consists of 29 questions divided in to 3 sections A ,B and C Section A consists of 10 questions of 1 mark, section B of 12 questions of 4 marks each and section C consists of 7 questions of 6 marks each.***
2. ***There is no overall choice, internal choice has to be provided in some questions. you have to attempt ,only one of the alternatives in all such questions.***

Section A

1. *Using the principal values find value of* $\sin^{-1}\left(\sqrt{\frac{1}{4}}\right) + \cos^{-1}\left(\frac{1}{2}\right)$.
2. *If* $\begin{bmatrix} 2x+1 & 2y \\ 0 & y^2+1 \end{bmatrix} = \begin{bmatrix} x+3 & 8 \\ 0 & 17 \end{bmatrix}$, *write the value of* $(x-y)$.
3. *Find the value of* A^2, *if* $A = \begin{bmatrix} 3 & 8 \\ 2 & -1 \end{bmatrix}$
4. *Examine the continuity of the function* $f(x) = 10x + x^3 - x^2$ *at* $x = 0$
5. *If* $M = \begin{vmatrix} 2 & 3 & -2 \\ -2 & 1 & 4 \\ x & 0 & 7 \end{vmatrix}$ *is a singular matrix, find .*
6. *Write the principal value of* $\cos^{-1}\left(\cos\frac{7\pi}{3}\right)$.
7. *Write the degree and order of the differential equation :* $\frac{d^2y}{dx^2} - \frac{dy}{dx} + 4y = 9$.
8. *Write the value of* $\int_0^1 \frac{2x}{1+x^2}\,dx$.
9. *If the determinant of the matrix A of order 3*3 is of value 4, write the value of* $|3A|$.
10. *If* $x = \sin\theta$, $y = -\tan\theta$, *find* $\frac{dy}{dx}$.

Section B

11. *Prove that* $\tan^{-1}\frac{3}{4} + \left(\tan^{-1}\frac{3}{5}\right) - \left(\tan^{-1}\frac{8}{19}\right) = \frac{\pi}{4}$.

12. *Find the value of k, such that the function 'f' defined by* $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & x < \frac{\pi}{2} \\ 3, & x \geq \frac{\pi}{2} \end{cases}$

(or) If the function $f(x)$ *is given by* $f(x) = \begin{cases} 3ax + b, & if\, x > 1 \\ 11, & x = 1 \\ 5ax - 2b, & if\, x < 1 \end{cases}$

13. *Using properties of determinants, prove the following:* $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix}$ = $3abc - a^3 - b^3 - c^3$

14. *solve the following differential equation: -* $\frac{dy}{dx} + secx.y = tanx$.

15. *solve the differential equation:* $x \frac{dy}{dx} = \sqrt{x^2 + y^2} + y$.

16. *If* $y = \log \sqrt{\frac{1 - \cos x}{1 + \cos x}}$, *show that* $\frac{dy}{dx} = \text{cosec}\, x$

17. Find the value of $\sqrt{25.2}$, using differentials. (or)
Radius of a variable circle is changing at the rate of 0.2cm/s. Find the rate of change in its Area if its radius is 10cm.

18. *Find the volume of the largest cylinder that can be inscribed in a sphere of radius r cm .(or) Verify Lagrange's mean value theorem for the function defined by* $f(x) = \sqrt{x^2 - 4}$ *in the interval* $[2,4]$

19. *evaluate :* $\int \frac{2x + 5}{\sqrt{7 - 6x - x^2}} dx$.

20. *if y=* $\square\square tan\square^{\dagger}(-1)\ (\square\ \square \cos x / \square 1 - sin\square x\ \square)$, *find* $\frac{dy}{dx}$.

21. *find the area of the region enclosed between two curves* $y^2 = 4ax$ *and* $x^2 = 4ay$.

22. *Express the following in simplest form :* $\square\square tan\square^{\dagger}(-1)\ (\square\ \square \cos x / \square 1 - sin\square x\ \square)$.

Section C

23. *If* $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$, *find* A^{-1} *and use it to solve the system of equations:*
x + y + 2z = 0; x + 2y – z = 9; x - 3y + 3z = -14

24. *Using properties of determinants prove the following:*

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$$

25. *find the area of the region between the two curves* $x^2 + y^2 = 4$ *and* $(x-2)^2 + y^2 = 4$.

26. Prove that the volume of greatest cylinder that can be inscribed in cone of height h and semi vertical angle 30^0 is $\frac{4}{81}\pi h^3$.

27. *solve :* $\int \frac{x^4}{(x+1)(x^2+1)}dx$.

28. *evaluate :* $\int_0^{\pi} \frac{x}{1+\sin x}dx$.

29. *If* $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ *, prove that* $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$. *(or)*

if $y = [(\tan]^{-1} x)^2$ *Then prove that :* $(1+x^2)^2 \frac{d^2y}{dx^2} + \frac{dy}{dx} 2x(1+x^2) = 2$

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