Sample Paper – 2011
Class – XII
Subject – Mathematics

Time: 3 Hours Max. Marks: 100

General Instructions:

1. All questions are compulsory.
2. This Question Paper consists of 29 questions divided into Three sections: A, B and C.
3. Marking scheme for Section A: Q.No. 1 to 10 are of 1 Mark each.
4. Marking scheme for Section B: Q.No. 11 to 22 are of 4 marks each.
5. Marking scheme for Section C: Q.No. 23 to 29 are of 6 marks each.
6. Use of calculators is not permitted.

Section-A

1. Find the domain: $f(x)=\dfrac{1}{\sqrt{x-|x|}}$.

2. Find the point at which the tangent to the curve $x+y=e^{xy}$ is parallel to y-axis.

3. Find the order and degree: $\left(\dfrac{d^2y}{dx^2}\right)^{2/3}+4-3\dfrac{d^2y}{dx^2}+5\dfrac{dy}{dx}=0$

4. Using Lagrange's Mean Value Theorem, find a point on the curve $y=(x-2)^{1/2}$ defined on the interval **[2, 3]** where the tangent is parallel to the chord joining the end points of the curve.

5. Integrate $\dfrac{1}{\sqrt{3}\sin x+\cos x}$ with respect to x.

6. Find the value(s) of a for which $(a+2)x^3-3ax^2+9ax-1$ decreases monotonically throughout for all real x.

7. Evaluate: $\displaystyle\int_0^{16\pi/3}|\sin x|\,dx$.

8. Find the distance of $\hat{i}-2\hat{j}+\hat{k}$ from the plane $\bar{r}.(\hat{i}+\hat{j}+\hat{k})=2$.

9. Twelve balls are distributed among three boxes. Find the probability that the first box will contain three balls.

10. If ***w*** is a cube root of unity, find the roots of the equation $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$.

Section-B

11. Find the domain and the range: f(x) = log {x}, where {.} represents the fractional part of the function.

Or,

11. If the relation between subnormal ***SN*** and subtangent ***ST*** at any point ***S*** on the curve $by^2=(x+a)^3$ is ***p(SN)=q(ST)***^{2}, then evaluate ***p: q***.

12. Find the period of the function satisfying the relation ***f(x) + f(x+3) = 0***, for all real x.

Or,

12. Let ***f(x) = [cosx + sin x], 0 < x < 2***π where [.] represents the greatest integer less than or equal to x. Find the number of points of discontinuity of f(x).

13. Using Intermediate value theorem, prove that there exists a number *x* such that

$$x^{2005} + \frac{1}{1+\sin^2 x} = 2005 .$$

14. By using determinants, prove that there exists no solution for the equation

x+4y-2z=3, 3x+y+5z=7, 2x+3y+z=5

15. Find the equation(s) of normal(s) to the curve $3x^2-y^2=8$ which are parallel to the line ***x+3y=4***.

16. Find the point of extremum of the function f(x)= $\int_1^x e^{-t^2/2}(1-t^2)dt$.

17. Find the angle at which the curves ***y=sin x*** and ***y= cos x*** intersect in $[0,\pi]$.

18. Solve the following system of in-equations:

$$\frac{x+3}{x-2} \le 2, \frac{2x+5}{x+7} \ge 3 .$$

19. A cloth of length 10 meters is to be randomly distributed among three brothers. Find the probability that no one gets more than 4 meters of cloth.

20. If $\bar{a} = 2i + k, \bar{b} = i + j + k, \bar{c} = 4i + 3j + 7k$.

Determine a vector satisfying the relation $\bar{r}\times\bar{b}=\bar{c}\times\bar{b}, \bar{r}.\bar{a}=0$.

Or,

20. Solve the equation: $\left(xy^2-e^{1/x^3}\right)dx-x^2ydy=0$

21. Evaluate: $\lim_{n\to\infty}\left(\frac{1}{n}+\frac{1}{n+1}+\frac{1}{n+2}+....+\frac{1}{7n}\right)$.

22. Solve: $\frac{dy}{dx}=\frac{yf'(x)-y^2}{f(x)}$

Section-C

23. If *f(x) = tan x*, where $x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ and g(x) = $\sqrt{1-x^2}$.

Determine *fog* and *gof*.

24. Find the period: f(x)= $\frac{|\sin x|-|\cos x|}{|\sin x+\cos x|}$.

25. If ***f(x)*** **=** $\frac{\sin ax^2}{x^2}, x\neq 0$ **.**

= $\frac{3}{4}+\frac{1}{4a}$ ***, x=0.***

Then, for what value(s) of *a*, ***f(x)*** is continuous at ***x=2***?

26. Evaluate: $\int_{-1}^{1}\frac{x^3+|x|+1}{x^2+2|x|+1}dx$.

27. Find the equations of bisecting planes $\bar{r}.\left(2\hat{i}+\hat{j}-2\hat{k}\right)=2$, $\bar{r}.\left(\hat{i}-2\hat{j}+2\hat{k}\right)=1$. Identify the acute and obtuse angles bisecting planes.

Or,

27. In the Mean Value Theorem $\frac{f(b)-f(a)}{b-a}=f'(c)$ if a=0, b=1/2, and ***f(x)=x(x-1)(x-2),*** find the value of c.

28. Determine the product $\begin{pmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{pmatrix}\begin{pmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{pmatrix}$ and use this to solve the system of equations: ***x-y+z=4 ,*** ***x-2y-2z=9 ,*** ***2x+y=3z=1***

29. If ***y =*** $\sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + ...to\infty}}}$ then prove that $\frac{dy}{dx}$ = $\frac{\cos x}{2y-1}$.

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