Sample Paper '2011
Class – XII
Subject – Mathematics

Time : 3 Hours Max. Marks : 100

General Instructions:

1. All questions are compulsory.

2. The question paper consist of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks .

3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4. There is no overall choice. However, Internal choice has been provided in 04 questions of four marks each and 02questions of six marks each. You have to attempt only one of the alternatives in all such questions.

5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION : A

1. Evaluate : $\sin\left[\frac{\pi}{2}-\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right]$
2. If $f:R\to R$ is defined by $f(x)=\left(3-x^3\right)^{\frac{1}{3}}$, find fof .
3. If $Y=\begin{bmatrix}3 & 2\\ 1 & 4\end{bmatrix}$ and $2X+Y=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}$, find X .
4. If $A=\begin{bmatrix}2 & 3\\ 5 & 9\end{bmatrix}$, find A.adjA .
5. Evaluate : $\begin{vmatrix}x+y & y+z & z+x\\ z & x & y\\ 1 & 1 & 1\end{vmatrix}$
6. Evaluate : $\int_{\frac{\pi}{2}}^{\pi}|\cos x|dx$
7. Evaluate : $\int\frac{dx}{x^2-x}$
8. Find a vector in the direction of $3\hat{i}-\hat{j}+4\hat{k}$ which has magnitude 6 units .
9. Find direction cosines of the vector whose direction ratios are 2 , -3 , 4 .
10. Find $\frac{dy}{dx}$ where $y=\tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}$.

SECTION : B

11. Show that the relation R in the set $A=\{x\in Z:0\le x\le 12\}$, given by

$R=\{(a,b):|a-b| \text{ is a multiple of } 4\}$ is an equivalence relation.

12. Solve for x : $\sin^{-1}(1-x)-2\sin^{-1}x=\frac{\pi}{2}$

13. If $A=\begin{bmatrix}a & 1\\ 0 & a\end{bmatrix}$,prove that $A^n=\begin{bmatrix}a^n & na^{n-1}\\ 0 & a^n\end{bmatrix}$ for all positive integers n.

OR,

Using elementary transformation , find the inverse of $A=\begin{bmatrix}1 & 3\\ 2 & 4\end{bmatrix}$

14. Consider $f:R_+\to[4,\infty)$ given by $f(x)=x^2+4$. Show that f is invertible and then find f^{-1}.

15. Find $\frac{dy}{dx}$ where $y=\tan^{-1}\frac{a\cos x-b\sin x}{b\cos x+a\sin x}$

OR

If $y=\sec x+\tan x$, prove that $\frac{d^2y}{dx^2}=\frac{\cos x}{(1-\sin x)^2}$

16. Find the interval for which $f(x)=2x^3-3x^2-36x+7$ is (i) strictly increasing and (ii) strictly decreasing.

17. Evaluate : $\int\frac{\sin 2x}{a\cos^2 x+b\sin^2 x}dx$

18. The volume of the spherical balloon being inflated changes at a constant rate. If initially its radius is 3 units and after 3 seconds it is 6 units, find the radius of the balloon after t seconds.

19. Evaluate the integral $\int_0^1 e^{2-3x}dx$ as the limit of sum . **OR,** Evaluate : $\int_0^{\frac{\pi}{4}}\frac{\sin x+\cos x}{9+16\sin 2x}dx$

20. Let $\vec{a}=\hat{i}+4\hat{j}+2\hat{k}$,$\vec{b}=3\hat{i}-2\hat{j}+7\hat{k}$, $\vec{c}=2\hat{i}-\hat{j}+4\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$, and $\vec{c}.\vec{d}=15$.

21. A variable plane which remain at a constant distance 3p from origin cuts the co-ordinate axes at A,B,C . Show that the locus of the centroid of ΔABC is $x^{-2}+y^{-2}+z^{-2}=p^{-2}$.

22. Suppose a girl throws a die . If she gets a 5 or 6 , she tosses a coin 3 times and notes the number of heads . If she gets a 1,2,3 or 4 she tosses a coin once and notes whether a head or tail is obtained . If she obtained exactly one head , what is the probability that she threw a 1,2,3 or 4 with the die.

SECTION : C

23. Find A^{-1} where $A=\begin{vmatrix}1 & 2 & 0\\ -2 & 1 & -2\\ 0 & 3 & 1\end{vmatrix}$ and hence solve the linear equations

$x-2y=10, 2x+y+3z=8, -2y+z=7$

24. A window is in the form of a rectangle surmounted by a semicircle . If the perimeter of the window is P cm , show that the window will admit maximum possible light only when the radius of semicircle is $\frac{P}{\pi+4}$ cm.

25. Find the area bounded by $\left\{(x,y):\frac{x^2}{a^2}+\frac{y^2}{b^2}\le 1\le \frac{x}{a}+\frac{y}{b}\right\}$

OR,

Find the area bounded by the curves $y=6x-x^2$ and $y=x^2-2x$

26. Prove that $\int_{-a}^{a} f(x)dx=\begin{cases}0 & \text{, if f(x) is odd function}\\ 2\int_{0}^{a} f(x)dx & \text{, if } f(x) \text{ is even function}\end{cases}$ and hence evaluate : $\int_{-1}^{1} x^{17}\cos^4 x\,dx$

27. Find the equation of the plane passing through $(0,7,-7)$ and containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$.

28. Two godowns A and B have gain capacity of 100 quintals and 50 quintals respectively. They supply to 3 ration shops D , E and F whose requirements are 60 , 50 and 40 quintals respectively . The cost of transportation per quintal from the godowns to the shops are given in the following table :

Transportation cost per quintal (in Rs)		
From / To	A	B
D	6	4
E	3	2
F	2.50	3

How should the supplies be transported in order that the transportation cost is minimum ? What is minimum cost ?

29. Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards . What is the probability that (i) all the five cards are spades ? (ii) only 3 cards are spade ?(iii) none is spade ?

Prepared By:

MRINAL SARMA
PGT, Gurukul Grammar Senior Secondary School,
Guwahati, Assam
Cell: +91-9864066569
E-mail: mrinal1973@gmail.com

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