SAMPLE PAPER

CLASS XII

MATHEMATICS – 2016-17

[Time Allowed: 3 Hours] **[Maximum Marks: 100]**

SECTION-A **[1×4=4]**

1. **If** $f(x)=[x], g(x)=|x|$ find $(f+2g)(-1)$
2. If A and B are symmetric matrices of same order show that AB + BA is a symmetric matrix.
3. Let 'x' be a binary operation on N given by $a*b=L.C.M.$ of (a,b) for all a,b $\in$ N. Find the identity element in N.
4. Find the unit vector perpendicular i+ $\hat{j}$ and $\hat{j}+\hat{k}$

SECTION-B **[2×8=16]**

5. Find the value of x if $\tan^{-1}x-\cot^{-1}x=\tan^{-1}\frac{1}{\sqrt{3}}$
6. Solve : $\begin{bmatrix}x & 1\end{bmatrix}\begin{bmatrix}1 & 0\\ -2 & -3\end{bmatrix}\begin{bmatrix}x\\ 5\end{bmatrix}=0$
7. Find $\frac{dy}{dx}$ if $y=\log_x 2$
8. Prove $Sin^{-1}\frac{8}{15}+\sin^{-1}\frac{3}{5}=\tan^{-1}\frac{77}{36}$
9. Show that the tangents to the curve $y=x^2-5x+6$ at the points (2,0) and(3,0) are orthogonal.
10. Evaluate $\int_0^{\pi}\left(\sin^2\frac{x}{2}-\cos^2\frac{x}{2}\right)dx$
11. Find a vector of magnitude 11 in the direction opposite to $\overrightarrow{PQ}$ when $P(1,2,3)$ and $(-1,0,8)$
12. Three dice are thrown. Find the probability of getting three two if it is known that the sum of the numbers on the dice was six.

SECTION-C $[4\times11=44]$

13. **If** $x+y+z=0$

    Prove $\begin{vmatrix}xa & yb & zc\\ yc & za & xb\\ zb & xc & ya\end{vmatrix}=xyz\begin{vmatrix}a & b & c\\ c & a & b\\ b & c & a\end{vmatrix}$

14. Find $\frac{dy}{dx}$, if $y=\sqrt{\frac{a-x}{a+x}}$ -a < x < a
15. If $x\sqrt{1+y}+y\sqrt{1+x}=0 \quad x\neq y$

Prove $\frac{dy}{dx}=-\frac{1}{(x+1)^2}$

16. Find the approximate volume of metal follow spherical shell whose internal and external radius 3cm and 3.0005cm.

OR

Find the value of $'a'$ so that the $f(x)$

Defined by $f(x)=\begin{cases}\frac{\sin^2 ax}{x^2}, & x\neq 0\\ 1 & x=0\end{cases}$

may be continuous at x **= 0**

17. Evaluate $\int(7x-2)\sqrt{3x+2}\ dx$

OR

Evaluate $\int\{1+2\tan x(\tan x+\sec x\}^{1/2}\ dx$

18. Solve : $(x^2+1)^2\frac{dy}{dx}+(x^2+1)2xy=1, y(0)=0$

19. Prove that $f(x)=x^2+x+1$ is one-one but not onto, $x\in N$.

20. If $\vec{a}+\vec{b}+\vec{c}=0$ prove that
$\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$

21. Find the equation of the plane passing through the intersection of the planes $2x-3y+z-4=0$ and $x-y+z+1=0$ and perpendicular to the plane $x+2y-3z+6=0$

22. Husband speaks truth 90% and wife speaks 60% of the cases. In what percentage of cases are they likely to contradict each other in the same fact.

23. Suppose you have two coins which appear identical in your pocket. One coin is fair and one is 2 headed if you take one coin, tossed and get a head, what is the probability that it was a fair coin?

SECTION-D $[6\times 6=36]$

24. If the area enclosed between the curve $y=ax^2$ and $x=ay^2(a>0)$ is 1sq. unit, then find the value of a.

25. An open tank with a square base and vertical sides is to be constructed from a metal sheet so as to hold a given quantity of water. Show that the cost of the material is least when the depth of the tank is half of its width.

26. Find the distance of the point (-1,-5,-10) form the point of intersection of the line
$\vec{r}=2\hat{l}-\hat{j}+2\hat{k}+\lambda(3\hat{l}+4\hat{j}+2\hat{k})$ and the plane $\hat{r}.(\hat{l}-\hat{j}+\hat{k})=5$

27. Evaluate $\int_0^{\pi}\frac{\sin x-\cos x}{1+sinx.\cos x}dx$

28. If A = $\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ then prove: $A^n=\begin{bmatrix}\cos n\theta & \sin n\theta\\ -\sin n\theta & \cos n\theta\end{bmatrix}$

OR

Find the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and solve

$x-y+z=4, x-2y-2z=9, 2x+y+3z=1$

29. Tow tailors, A and B earn Rs.15 and Rs. 20 perday. A can stitch 6 shirts and 4 pants while B can stich 10 shirts and 4 pants per day. How many days shall each work if it is desired to produced atleast 60 shirts and 32 pants at a minimum labour cost.

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