CLASS XII
SAMPLE PAPER
MATHEMATICS

Time Allowed: 3 Hours | Maximum Marks: 100 M

General Instructions:

This question paper consists of 29 questions.
All questions are compulsory.
Questions 1 – 4 carry1 mark each, ,questions 5 – 12 carry 2mark each, questions 13 – 23 carry 4 marks each and questions 24 – 29 carry 6 mark each.

SECTION A

1) If $f(x)=[x]$ and $g(x)=|x|$ find (gof) $[-\frac{5}{3}]$

2) Find the principal value of $\text{cosec}^{-1}\left(2\tan\frac{11\pi}{6}\right)$

3) If AB=A and BA=B. Show that $A=A^2$

4) Find the equation of the line passing through (1,-2,5) and perpendicular to the plane 2x + 3y – z =8

SECTION B

5) With out expanding evaluate: $\begin{vmatrix} 41 & 1 & 5 \\ 49 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$

6) If $\begin{bmatrix} xy & 4 \\ 2+6 & x+y \end{bmatrix}=\begin{bmatrix} 8 & \omega \\ 0 & 6 \end{bmatrix}$ find $x+y+z$.

7) Find the rate of change of the area of a circle with respect to its circumference when radius is 3cm.

8) Find the point of local minima or local maxima if any of $f(x)=\sin 2x-x, -\frac{\pi}{2}\le x\le\frac{\pi}{2}$

9) Find the angle between the line $\vec{r}=\hat{i}+2\hat{k}+\lambda\left(\hat{i}-2\hat{j}+3\hat{k}\right)$ and the plane $2x-3y+z=3$.

10) Find the angle between the lines.
$2x=3y=-z$ and $6x=-y=-4z$

11) Find the angle between $\left|\vec{a}\times\vec{b}\right|=\vec{a}.\vec{b}$

12) Find the area of the ABC triangle having vertices A(1,-2,3),B(0,4,-4) and C(3,6,9).

SECTION C

13) Show that $\begin{vmatrix} x & p & q \\ p & x & q \\ q & q & x \end{vmatrix} = (x-p)(x^2+px-2q^2)$

14) A trust fund has Rs. 30,000 that has to invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs. 30,000 among two types of bonds to obtain an annual total interest Rs. 1800.

15) Find the value of a,b,c so that

$$f(x) = \begin{cases} \dfrac{Sin(a+1)x + \sin x}{x}, & x < 0 \\ c & x = 0 \\ \dfrac{\sqrt{x+bx^2} - \sqrt{x}}{bx\sqrt{x}} & x > 0 \end{cases}$$

Is continuous at $x = 0$

16) Differentiate w.r.t. x

$y = 5^{3-x^2} + (3-x^2)^5$

17) Evaluate : $\int \dfrac{\sin x + \cos x}{1+\sin 2x} dx$ OR

Evaluate : $\int e^x \left(\dfrac{x^2+1}{(x+1)^2} \right) dx$

18) Evaluate : $\int_0^{\pi/2} \sin 2x \; tan^{-1}(\sin x)\, dx$ OR Evaluate: $\int_0^{\pi} \frac{X}{a^2 COS^2 X + b^2 sin^2 X}$

19) Let S be a relation on the set R of all real numbrs defined by

S = $\{(a,b) : a^2 + b^2 = 1\}$

Prove that S is not an equivalent relation on R

20) If $\sin^{-1}\frac{2a}{1+a^2} + sin^{-1}\frac{2b}{1+b^2} = 2\tan^{-1}x$, Prove that $x = \dfrac{a+b}{1-ab}$

21) Show that the maximum value of $\left(\dfrac{1}{x}\right)^2$ is $e^{\frac{1}{e}}$.

Or,

Find the angle of intersection of the line $xy = 6$ and $x^2 y = 12$.

22) Find the distance of the point $\hat{i} + 6\hat{y} + 3\hat{k}$ from the line $\vec{r} = \hat{i} + 2\hat{k} + \lambda(\hat{i} - 2\hat{j} + 3\hat{k})$

23) A man known to speak the truth 3 times out of the 5 times. He throw a die and reported that it is one. Find the probability that it is actually one.

SECTION D

24) An isosceles triangle of vertical angle 2θ is inscribed in a circle of radius r. Show that the area of the triangle is maximum when $\theta = \frac{\pi}{6}$.

Or

Show that the volume of the greatest cylinder which can be inscribed in a cone of height h and semi vertical angle 45^0 is $\frac{4}{27}\pi h^3$.

25) Find the point intersection of the planes 2x – y + z = 4, 5x + 7y + 2z = 0 and 3x + 4y – 2z + 3 =0.

26) Solve : $x^2dx - \left(x^3 + y^3\right)dx = 0$

Or,

Solve $x\frac{dx}{dx} + y - x + xy \quad \cot x = 0$

27) Find the area of the region $\left\{(x,y) : \frac{x^2}{y^2} + \frac{y^2}{b^2} \le \left|\le \frac{x}{a} + \frac{y}{b}\right.\right\}$

OR

$\left\{(x,y) : |x-1| \le y \le \sqrt{5-x^2}\right\}$

28) A letter is known to have come either from LONDON or CLIFTON on the letter two consecutive letters on ON are visible . What is the probability that the letter has come from

(i) LONDON, (ii) CLIFTON

29. If a young man rides his motor cycle at 25 km/h, he has to spend Rs 2 / km on petrol, if he rides it at a faster speed at 40km/h, he spend Rs 5/km on petrol. He has Rs100 to spend on petrol and wishes to travel maximum distance with in on hour. Expess this as a linear programming and solve it.

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