MODEL QUESTION PAPER
MATHEMATICS
Class 12th

Time: 3 hrs

Maximum Marks: 75
All questions are compulsory
Section A [Long Answer Type] 5 x 5 = 25 marks

1. Find the equation of a tangent and normal to an Ellipse

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1 \quad at\ (x_1,y_1).$$

Or

Calculate absolute maximum value and absolute minimum value of

$$f(x)=-x^3+10x^2-12x\,;3\le x\le 9.$$

2. Evaluate

$$\int\frac{e^{2\log x}-e^{-\log x}}{e^{2\log x}-e^{\log x}}dx.$$

Or

Evaluate

$$\int\frac{x^3+3x^2+3x+4}{x^2+2x+1}dx.$$

3. Evaluate

$$\int_0^{\pi/2}\frac{\sqrt{\tan x}}{\sqrt{\tan x}+\sqrt{\cot x}}dx.$$

Or

Evaluate

$$\int\frac{dx}{(x-a)^2(x-b)}.$$

4. A particle is moving in a straight line from a fixed point according to the law $x=t^3-4t^2+3t+5$. Where x is in mts. t is in seconds. Find the distance, velocity & acceleration at the end of 3 seconds.

Or

A particle moves in a straight line according to law $S=t^3+at^2+bt+c$.
Where S is in mts. t is in seconds and a,b,c are constants. Find the value of
a,b *and* c it being given that $t=1,\ S=7m/s\ f=12m/s^2$.

5. A weight of 36 kg is suspended by two ropes 6m and 8m long fastened to two points on some horizontal line 10m apart. Find tension in two ropes.

Or

19. If three forces are acting at a point in equilibrium, then find angle between them.

20. Find the acceleration of a body whose displacement is $S = 3t^3 + 5t^2 + 2$ at the end of $2\sec s$.

21. If the resultant of two forces P & Q makes an angle θ with P. Prove that $\tan\theta = \dfrac{R\sin x}{P + Q\cos\alpha}$.

22. Solve the Differential equation $x\,dy = y\,dx$.

23. Find the integrating factor of a differential equation $\dfrac{dy}{dx} + \tan x^y = x^2$.

Section D [Objective type Questions] 6 x 1 = 6 marks

24. $\int \operatorname{cosec} x\,dx$

a] $\log\cot x$

b] $\log(\operatorname{cosec} x + \cot x)$

c] $-\log(\operatorname{cosec} x + \cot x)$

d] None of the above

25. $\int a^x dx$

a] $a^x / \log a$

b] $a^x \log a$

c] a^x

d] None of the above

26. $\int_0^a f(x)dx$

a] $\int_0^a f(a-x)dx$

b] $-\int_0^a f(x)dx$

c] $\int_0^a f(-x)dx$

d] None of the above

27. $\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx$

If

a] $f(x)$ is odd

MATHEMATICS
Model Paper
Class 12th

Maximum Marks: 75 **Time: 3 hrs**
Paper "B"
Attempt all the questions:

Section A [Long Answer Type] 5 x 5 = 25 marks

1. Prove that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc + ab + bc + ca .$$

Or

Using properties of determinants, prove that

$$\begin{vmatrix} x & x^2 & y^2 \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx).$$

2. Solve the following system of equations

$$x - y + z = 4$$
$$2x + y - 3z = 0 .$$
$$x + y + z = 2$$

Or

Find the inverse of matrix

$$A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$$

3. Differentiate $Sec\sqrt{x}$ by using first principle method.

Or

Differentiate $Cos^{-1}\left(\frac{a + bCosx}{b + aCosx}\right)$.

4. Find the shortest distance between the lines $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1$ & $\vec{r} = \vec{a}_2 + \delta \vec{b}_2$.

Or

Prove that

$$\left[\vec{a}\times\vec{b} \quad \vec{b}\times\vec{c} \quad \vec{c}\times\vec{a}\right] = 2\left[\vec{a}\ \vec{b}\ \vec{c}\right].$$

5. Differentiate $e^{\sqrt{x}}$ by using Ist principle method.

Or

Prove that $(AB)' = B'A'$.

Section B [Short Answer Type] 8 x 3 = 24 marks

6. Find adjoint (A) when $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

7. Prove that $a \cdot (a+b) = a$.

8. If A *and* B are independent events $\begin{matrix} P(A') = P(A \cup B) = 0.65 \\ P(B) = x \end{matrix}$

Find the value of x.

9. Find the domain of a function $f(x) = \dfrac{1}{\sqrt{(x-2)(x-5)}}$.

10. Prove that $\lim\limits_{x \to 0} \dfrac{\sin x}{x} = 1$.

11. Differentiate $(\log x)^x$.

12. Find $\left(\dfrac{1}{x}\right)^x + x^{1/x}$.

13. Find the angle between a line $\vec{r} = \left(3\vec{i} + 2\vec{j}\right) + \lambda\left(6\vec{i} + \vec{j} - \vec{k}\right)$ and

a plane $\vec{r} \cdot \left(3\vec{i} + 2\vec{j}\right) = 5$.

Section C [Very Short Type Answers] 10 x 2 = 20 marks

14. Define inversal law of matrices.

15. Define symmetric matrix.

16. Assume that $\begin{matrix} a \cdot a' = 0 \\ a + a' = 1 \end{matrix}$ for every $a \in B$

Prove that $a + a = a$.

17. Define independent event.

18. Define probability distribution function.

19. Differentiate $\sin^{-1}\sqrt{x}$

20. Find $\lim\limits_{x \to a}[x]$ when a is an integer.

21. Prove that $\left[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}\right] = 0$.

22. Find the volume of a parallelopiped when its edges are represented by

$\vec{a} = \vec{i} + 2\vec{j}, \quad \vec{b} = \vec{j} + 2\vec{k}, \quad \vec{c} = \vec{i} + 2\vec{j} + 3\vec{k}$.

23. Find the angle between the plane $\vec{r} \cdot \left(3\vec{i} + 2\vec{j} + 5\vec{k}\right) = 7 \quad \& \quad \vec{r} \cdot \left(\vec{i} - \vec{j}\right) = 6$

Section D [Objective type Questions] 6 x 1 = 6 marks

24. If A is a non-singular matrix, then the system of equations $AX = B, B \neq 0$ is said to be

a] Consistent
b] Inconsistent
c] None of the above

25. If A *and* B are two independent events, then $P(A' \cap B')$ is equal to

a] $P(A')\,P(B')$
b] $P(A') + P(B')$
c] $1 - P(A \cap B)'$
d] $P(A \cup B)'$

26. $P(E)$ Where E is the event of getting a black 7 out of 52 cards drawn

a] $\frac{1}{26}$
b] $\frac{2}{25}$
c] $\frac{2}{26}$
d] $\frac{1}{52}$

27. Which of the following are independent laws

a] $a + a = a$, $a \cdot a = a$
b] $a \cdot 1 = a$, $a + 0 = a$
c] $a + 1 = 1$, $a \cdot 0 = 0$
d] None of the above

28. The projection of $\vec{a}$ *on* $\vec{b}$ is

a] $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|}$

b] $\frac{\vec{a}\cdot\vec{b}}{|\vec{a}|}$

c] $\frac{\vec{a}+\vec{b}}{|\vec{a}|}$

d] None of the above

29. The angle between the vector $\vec{a}=\vec{i}+\vec{j}+\vec{k}$ & one of the axises is

a] $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

b] $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

c] $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

d] $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$