SAMPLE QUESTION PAPER 5
Class – XII
MATHEMATICS

Time allowed: 3hrs   **Maximum Marks: 100**

General Instructions:

(i) All questions are compulsory.

*(ii) The question paper consists of **26 questions** divided into three Sections **A, B and C.***

*(iii) Question No. **1 to 6** in Section A are Very Short Answer Type Questions carrying **one mark** each.*

*(iv) Question No. **7 to 19** in Section B are Long Answer I Type Questions carrying **four marks** each.*

*(v) Question No. **20 to 26** in Section C are Long Answer II Type Questions carrying **six marks** each.*

(vi) There is no overall choice. However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

(vii) Use of calculator is not permitted. You may ask for logarithmic tables, if required.

SECTION A

Question number 1 to 6 carry 1 mark each

1. Find x such that $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

2. Prove that A-A' is skew symmetric.

3. Does inverse of $\begin{bmatrix} -2 & -1 \\ 4 & 2 \end{bmatrix}$ exits?

4. Give an example of a relation which is symmetric but not reflexive and transitive.

5. Find the direction cosines of x-axis.

6. What is the domain of $\sin^{-1} x$?

SECTION B

Question numbers 7 to 19 carry 4 marks each

7. By using properties of determinants, show that

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = 1+a^2+b^2+c^2$$

8. Find the equations of the tangent and the normal to the curve

   x = cost , y= sin t at t = $\frac{\pi}{4}$

9. Show that if f: A→ B and g : B → C are onto, then gof : A→ C is onto

10. Find $\frac{dy}{dx}$: $2x+3y = \sin y$

11. Prove $$3\sin^{-1} x = \sin^{-1}\left(3x - 4x^3\right), \; x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$$

12. If A, B, C have the co-ordinates (2,0,0) , (0,1,0) , (0,0,2) , then show that ABC is an isosceles triangle.

13. Two unbiased dice are thrown. Find the probability that neither a doublet nor a total of 10 will appear?

14. The total revenue in rupees received from the sale of x units of a medicine is given by $R(x) = x^3 - e^x - 1/x$. Find the marginal revenue when x=5. List two precautions a responsible chemist should follow.

15. Find the differential equation of the system of circles touching x-axis at the origin

16. Show that $(|\vec{b}|\vec{a} + |\vec{a}|\vec{b}).(|\vec{b}|\vec{a} - |\vec{a}|\vec{b}) = 0$

17. Integrate $\int \frac{dx}{x(x^4 - 1)}$

18. Find the vector equation of the plane passing through the intersection of the planes
    $\vec{r}.(2i + 2j - 3k) = 7, \; \vec{r}.(2i + 4j + 3k)$ and the point (2,1,3)

19. If $$A = \begin{pmatrix} \cos\alpha - \sin\alpha \\ \sin\alpha - \cos\alpha \end{pmatrix}$$, then for what value of α is A an identity matrix?

SECTION C

Question numbers 20 to 26 carry 6 marks each

20. Determine the points on the curve $y = (1/4)x^2$ nearest to the point (0,5) .

21. The cost of 4 kg onions, 3kg wheat and 2 kg rice is 60. The cost of 2 kg onions, 4kg wheat and 6 kg rice is 90. The cost of 6 kg onions, 2kg wheat and 3 kg rice is 70. Find the per kg cost of each of the three commodities.

22. A manufacturing company makes two models A and B of a product. Each piece of model A requires 9 labour hours for fabricating and 1 labour hour for finishing. Each piece of model B requires 12 labour hours for fabricating and 3 labour hour for finishing. For fabricating and finishing the maximum labour hours available are 180 and 30 respectively. The company makes a profit of rs. 8000 on each piece of model A and 12000 on each piece of model B.

23. A man is known to speak the truth 3 out of 4 times. He throws a dice and reports that it is 4. Find the probability that is actually 4.

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

25. Integrate $\int_0^x \frac{x\,dx}{4\cos^2 x + 9\sin^2 x}$

26. Show that the lines $\vec{r} = (-3\hat{i} + \hat{j} + 5\hat{k}) + \beta(-3(\hat{i}) + \hat{j} + 5\hat{k})$
    $\vec{r} = (-\hat{i} + 2\hat{j} + 5\hat{k}) + \mu(-(\hat{i}) + 2\hat{j} + 5\hat{k})$ are coplanar. Also, find the equation of the plane containing these lines.