Sample Paper- (unsolved)

Mathematics

Class – XII

Time allowed: 3 hours Maximum Marks: 1**00**

General Instructions:

a) All questions are compulsory.

b) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.

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

d) Use of calculators is not permitted.

Section A

1. Write the elements of the 2x1 matrix $A = [a_{ij}]$ $when\ a_{ij} = \frac{|2i-j|}{3i}$.
2. Write the equation of a plane with intercepts 2,3,5 on the x,y,z axis respectively.
3. Find the domain and range of the function $f(x) = \frac{x-3}{x+1}$
4. For what value of k, the matrix $\begin{bmatrix} k & 2 \\ 3 & 4 \end{bmatrix}$ has no inverse.
5. Find the principal value of $\tan^{-1}(-1)$.
6. If A={1,2,3,4,5,6} write the relation aRb such that a+b=8, a,bÎA?

Section B

7. Using properties of determinants show that: $\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = (5x+4)(4-x^2)$
8. Find $\frac{dy}{dx}$ $if\ x = e^{\theta}(2\ sin\theta + \sin 2\theta)$,y=$e^{\theta}(2cos\theta + \cos 2\theta)$
9. Show that the relation R defined by (a,b)R(c,d)→a+d=b+c on the set N*N is an equivalence relation.
10. Form the differential equation representing the family of curves y=bsin(x+a) where a,b are arbitrary constants.
11. Evaluate $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$.

12. Find the distance of the point (3,-2,1) from the plane whose equation is given by 2x-y+2z+3=0.

13. In a hostel 60% of the students read Hindi newspaper, 40% read English and 10% read both Hindi and English newspapers. A student is selected at random. Find the probability that:

    (i) She reads neither Hindi nor English newspaper.

    (ii) If she reads English, find the probability that she reads Hindi newspaper.

    What is the conduct one should keep in mind when living in a hostel?

14. Find the point of discontinuity of the function:

$$f(x) = \begin{cases} \dfrac{|x^2 - 1|}{x - 1} & x \neq 1 \\ 2 & x = 1 \end{cases}$$

15. Find the intervals in which the function f given by f(x)= $2x^3 - 3x^2 - 36x + 7$ is strictly increasing.

16. If the position vector of the vertices of a triangle are $\hat{\imath} + 2\hat{\jmath} + 3\hat{k}, 2\hat{\imath} + 3\hat{\jmath} + \hat{k}, 3\hat{\imath} + \hat{\jmath} + 2\hat{k}$. Show that the triangle is equilateral.

17. Integrate $\int_0^{\frac{\pi}{2}} \frac{sin^5 x}{sin^5 x + cos^5 x}\, dx$

18. Find the vector equation of the plane passing through the intersection of the planes, $\vec{r}.\left(2\hat{\imath} + 2\hat{\jmath} - 3\hat{k}\right) = 7, \vec{r}.\left(2\hat{\imath} + 5\hat{\jmath} + 3\hat{k}\right) = 9$ through the point (2,1,3).

19. If $\hat{a}\ and\ \hat{b}$ are two unit vectors and θ is the angle between them, then show that $\sin\frac{\theta}{2} = \frac{1}{2}\left|\hat{a} - \hat{b}\right|$.

20. Find the product of the matrices A=$\begin{pmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{pmatrix}, B = \begin{pmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{pmatrix}$ and use it for solving the equations

    X+y+2z=1

    3x+2y+z=7

    2x+y+3z=2

21. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $2R/\sqrt{3}$. Also, find the maximum volume.

22. A merchant plans to sell two types of personal computers – a desktop model and a portable model that will cost 25,000 and 40,000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of commodity that the merchant should stock up to get maximum profit if he does not want to invest more than 70 lakh and if his profit on the desktop model is 4500 and portable model is 5000.
23. Find the area of the smaller part of the circle $x^2 + y^2 = a^2$ cut off by the line x $= \frac{a}{\sqrt{2}}$.
24. A card from a pack of 52 cards is lost. From the remaining pack two cards are drawn and both are found to be diamonds. Find the probability of the lost card being diamond.
25. Differentiate $x^{\sin x}$ $w.r.t$ $(\sin x)^x$.
26. Evaluate $\int \frac{x^2}{(x^2+1)(x^2+4)} dx$.