CLASS XII
SAMPLE PAPER
INFORMATICS PRACTICES(065)

MAX –MARKS-100 **TIME: 3.00 Hr**

SECTION-A

1. Let $f : R - \left\{-\frac{3}{2}\right\} \rightarrow R$ be a function defined as, $f(x) = \frac{2x}{5x+3}$, find f^{-1} : Range of $f : aR - \left\{-\frac{3}{5}\right\}$.

2. Write the range of one branch of $\sin^{-1} x$, other than the Principal Branch.

3. If $A = \begin{pmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{pmatrix}$, find x, $0 < x < \frac{\pi}{2}$ when $A + A' = I$.

4. If B is askew symmetric matrix, write whether the matrix (ABA') is symmetric or skew symmetric.

5. On expanding by first row, the value of a third order determinant is $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$. Write the expression for its value on expanding by 2nd column. Where A_{ij} is the cofactor of element a_{ij}.

6. Write a value of $\int \frac{1+\cot x}{x+\log \sin x} dx$

7. Write the value of $\int_0^{\pi/2} \log\left[\frac{3+5\cos x}{3+5\sin x}\right] dx$

8. Let $\vec{a}$ and $\vec{b}$ be two vectors such that $|\vec{a}| = 3$ and $|\vec{b}| = \frac{\sqrt{2}}{3}$ and $\vec{a} \times \vec{b}$ is a unit vector. Then what is the angle between $\vec{a}$ and $\vec{b}$?

9. Write the value of $\hat{i}.(\hat{j}\times\hat{k})+\hat{j}.(\hat{k}\times\hat{i})+\hat{k}.(\hat{j}\times\hat{i})$

10. For two non zero vectors $\vec{a}$ and $\vec{b}$ write when $|\vec{a}+\vec{b}|=|\vec{a}|+|\vec{b}|$ holds.

SECTION – B

11. Show that the relation R in the set $A=\{x \mid x\in W, 0\le x\le 12\}$ given by $R=\{(a,b):(a-b)\,\text{is a multiple of } 4\}$ is an equivalence relation. Also find the set of all elements related to 2.

OR

Let * be a binary operation defined on $N\times N$, by (a,b)*(c, d) = (a+c, b+d). Show that * is commutative and associative. Also find the identity element for * on $N\times N$, if any.

12. Solve $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x-1}{x+2}\right)=\frac{\pi}{4}, |x|<1$.

13. If a,b and c are real numbers and $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix}=0$. Show that either a + b + c = 0 or a = b = c.

14. If $f(x)=\begin{cases} \frac{x-5}{|x-5|}+a & , \quad \text{if } x<5 \\ a+b & , \quad \text{if } x=5 \\ \frac{x-5}{|x-5|}+b & , \quad \text{if } x<5 \end{cases}$ is a continuous function. Find a,b.

15. If $x^y+y^x=\log a$, find $\frac{dy}{dx}$.

16. Use lagrange's Mean Value theorem to determine a point P on the curve $y=\sqrt{x-2}$ where the tangent is parallel to the chord joining (2,0) and (3,1).

17. Evaluate : $\int \frac{1}{\cos(x-a)\cos(x-b)}dx$

OR

Evaluate : $\int \frac{2+\sin x}{1+\cos x}.e^{x/2}dx$.

18. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them, then prove that $\cos^{\theta/2} = \frac{1}{2}|\vec{a}+\vec{b}|$.

OR

If are the diagonals of a parallelogram with sides, $\vec{a}$ and $\vec{b}$, find the area of parallelogram in terms of $\vec{d}_1$ and $\vec{d}_2$ and hence find the area with $\vec{d}_1 = i + 2\hat{j} + \hat{k}$ and $\vec{d}_2 = 3i - 2\hat{j} + k$.

19. Find the shortest distance between the lines, whose equations are

$$\frac{x-8}{3} = \frac{y+9}{-16} = \frac{10-z}{-7} \text{ and } \frac{x-15}{3} = \frac{58-2y}{-16} = \frac{z-5}{-5}.$$

20. A bag contains 50 tickets numbered 1,2,3,...,50 of which five are drawn at random and arranged in ascending order of the number appearing on the tickets $(x_1 < x_2 < x_3 < x_4 < x_5)$. Find the probability that $x_3 = 30$.

21. Show that the differential equation

$$2ye^{x/y} + (y - 2xe^{x/y})y = 0 \text{ is}$$

homogeneous and find its particular solution given that x = 0 when y = 1.

OR

Find the particular solution of the differential equation $\frac{dx}{dy} + y\cot x = 2x + x^2\cot x, x \neq 0$ given that y=0,when $x = \frac{\pi}{2}$.

SECTION-C

22. Form the differential equation representing the family of ellipses having foci on x-axis and centre at origin.

23. A letter is known to have come from either TATANAGAR or CALCUTTA. On the envelope just two consecutive letters TA are visible. What is the probability that the letter has come from

    (i) Tata nagar (ii) Calcutta

OR

Find the probability distribution of the number of white balls drawn in a random draw of 3 balls without replacement from a bag containing 4 white and 6 red balls. Also find the mean and variance of the distribution.

24. Find the distance of the point (3,4,5) from the plane $x+y+z=2$ measured parallel to the line $2x=y=z$.

25. Using integration, compute the area bounded by the lines $x+2y=2$, $y-x=1$ and $2x+y=7$

OR

Find the ratio of the areas into which curve $y^2=6x$ divides the region bounded by $x^2+y^2=16$.

26. Evaluate : $\int \frac{e^{\tan^{-1}x}}{(1+x^2)^2}dx$.

27. A point on the hypotenuse of a right triangle is at a distance 'a' and 'b' from the sides of the triangle. Show that the minimum length of the hypotenuse is $[a^{2/3}+b^{2/3}]^{3/2}$.

28. Using elementary transformations find the inverse of the matrix

$$\begin{pmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{pmatrix}$$

29. A furniture firm manufactures chairs and tables, each requiring the use of three machines A, B and C. Production of one chair requires 2 hours on machine A, 1 hour on machine B and1 hour on machine C. Each table requires 1 hour each on machine Aand B and 3 hours on machine C. The profit obtained by selling one chair is Rs. 30 while by selling one table the profit is Rs. 60. The total time available per week on machine A is 70hours, on machine B is 40 hours and on machine C is 90 hours. How many chairs and tables should be made per week so as to maximize profit? Formulate the problem as L.P.P. and solve it graphically.

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