

2011

Time : 3 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

Answer any five questions in which Q. No. 1 is compulsory.

1. Indicate the correct answer :

   (a) A matrix is not a square matrix if :

   (i) $m > n$

   (ii) $n > m$

   (iii) $m \neq n$

   (iv) None of these

   Where $m \times n$ is the order of the matrix.

   (b) If A and B are two $n \times n$ matrices, then which of the following is not equal to $(A + B)^2$?

   (i) $(B + A)^2$

(ii) $(A + B)A + (A + B)B$

(iii) $A^2 + AB + BA + B^2$

(iv) $A^2 + 2AB + B^2$

(c) In skew symmetrix matrix, the diagonal elements are :

(i) All zeros

(ii) Not all zero's

(iii) All negative

(iv) None of these

(d) For which values of 't', does the following linear system of equations have infinitely many solutions ?

$tx + y = 1, 6x + (t + 1)y = 3$

(i) $t = +3$

(ii) $t = 2$

(iii) $t = 2$ and 3

(iv) None of these

(e) Find the minimum number of sub-intervals for applying Simpson's $\frac{1}{3}$rd rule :

(i) 1

(ii) 2

(iii) 3

(iv) None of these

(f) The equation of ellipse is :

(i) $\frac{x}{a}+\frac{y}{b}=1$

(ii) $x^2+y^2=a^2$

(iii) $y^2=ax$

(iv) None of these

(g) The number of real roots in the equation $x^3-4x^2+17x=0$ is :

(i) 1

(ii) 2

(iii) 3

(iv) None of these

(h) In the difference table, the independent variable is called as :

(i) Argument

(ii) Entry

(iii) Constant

(iv) None of these

2. Explain the idea to solve a set of linear equations using Gauss Elimination Method. Solve the set of equations by this method :

$$x - 3y + z = 4$$

$$2x - 8y + 8z = -2$$

$$-6x + 3y + 15z = 9$$

3. Discuss the basic idea behind Jacobi Method. Is it possible to solve the set of linear equations given in Question No. (2) ? If possible, solve it.

4. What do you mean by interpolation and extrapolation ? Justify when you will prefer each of them. Construct a forward difference table for the following data :

x	f(x) = y
0	9
1	10
2	35
3	54
4	46

Find f(2.7). Explain how you will find f(4.5).

5. Discuss the basic idea to solve a set of linear equations using CRAMER's rule. Solve the following set of equations using the same method (if possible) :

$$2x - y + 3z = -3$$
$$-x - y + 3z = -6$$
$$x - 2y - z = -2$$

6. What do you mean by eigenroots and eigenvectors of a matrix ? Find the eigenroots and eigenvectors of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$.

7. Discuss the basic idea behind Simpson's $\frac{1}{3}$rd rule. Evaluate $\int_0^1 \frac{dx}{1+x}$ by using this method corrected upto four decimal places. Also, explain how does this method differ from Simpson's $\frac{1}{3}$rd rule.

8. Write down the basic steps on Bisection method of find root of a function f(x). Is this method equal to binary search ? Justify your answer.

9. Explain least square principle. Fit a least square line to the following data :

x	y
1	2
2	5
3	3
4	8
5	7