

M.SC. MATHEMATICS
FIRST SEMESTER
NUMERICAL ANALYSIS
MSM-104 IDMn
[USE OMR FOR OBJECTIVE PART]

2024/12

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

(Objective)

Time: 15mins.

Marks: 10

1×10=10

Choose the correct answer from the following:

1. $E^{-2} f(x+h) =$ _____
a. $f(x+2h)$
b. $f(x-2h)$
c. $f(x-h)$
d. $f(x+h)$
2. Which of the following relation is true ?
a. $E-1 = 1+\Delta$
b. $E = 1+\nabla$
c. $E = 1+\Delta$
d. $E = 1-\Delta$
3. If the data is equally spaced and interpolation is near the beginning of the data then _____ interpolation formula is used.
a. Newton's backward difference
b. Newton's divided difference
c. Lagrange's
d. Newton's forward difference
4. $E\nabla = \nabla E = \dots$ _____
a. ∇
b. Δ
c. a or b
d. a and b
5. $(\Delta\nabla)f(x) =$ _____
a. $(\Delta - \nabla)f(x)$
b. $(\Delta + \nabla)f(x)$
c. $\Delta f(x)$
d. $\nabla f(x)$
6. If the data is equally spaced and interpolation is near the end of the data then _____ interpolation formula is used.
a. Newton's Forward Difference
b. Newton's back ward Difference
c. Newton's Divided Difference
d. Lagrange
7. The process of finding the values inside the interval (X_0, X_n) is called
a. Interpolation
b. Extrapolation
c. Polynomial Equation
d. Iteration
8. The Delta of power two is called the _____ order difference operator
a. First
b. Second
c. Third
d. Fourth

9. The relationship between E and Δ is _____
- | | |
|---------------------|---------------------|
| a. $E = 1 - \Delta$ | b. $E = 1 + \Delta$ |
| c. $E = \Delta - 1$ | d. $E = \Delta$ |
10. What is the value of $E^{-1} =$
- | | |
|-------------|-----------------|
| a. Δ | b. $1 + \Delta$ |
| c. ∇ | d. $1 - \nabla$ |

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(Descriptive)

Time : 1 hr. 15 mins.

Marks: 25

[Answer question no.1 & any two (2) from the rest]

1. Prove that $\Delta \nabla = (E^{\frac{1}{2}} - E^{-\frac{1}{2}})^2 = \Delta - \nabla$

5

2. a. State the Newton Gregory's forward interpolation formula and calculate population of city in the decimal census is given below

7+3=10

Year	1961	1971	1981	1991	2001
Population (Thousands)	46	66	81	93	101

Estimate the population for the year 1975

- b. If $y_0 = 3, y_1 = 12, y_2 = 81, y_3 = 200$ and $y_4 = 1000$ then calculate the value of $\Delta^4 y_0$

3. a. If $f(x) = \frac{5x+12}{x^2+5x+6}$, then find $\Delta^2 f(x)$ taking interval of difference as unity

5+5=10

b. $\Delta \log f(x) = \log \left\{ 1 + \frac{\Delta f(x)}{f(x)} \right\}$

4. a. Find a positive real root of $2x^3 - 3x - 6 = 0$ by Newton Raphson's method correct to five decimal places.

6+4=10

- b. Use the Trapezoidal rule to approximate $\int_0^2 (x^2 + 1) dx$ for $n = 4$ sub-intervals

5. a. Apply Gause elimination method to solve the equations

5+5=10

$$x + 4y - z = -5$$

$$x + y - 6z = -12$$

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

- b. Solve the linear equations by Gause Jordan method

$$3x + 2y + 7z = 4$$

$$2x + 3y + z = 5$$

$$3x + 4y + z = 7$$

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