2024/12

SET A

M.Sc. MATHEMATICS
FIRST SEMESTER
NUMERICAL ANALYSIS
MSM – 104

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs. **Full Marks: 35**

Objective

Time: 15mins. **Marks: 10**

Choose the correct answer from the following: ***1×10=10***

1. Select the true relation from the followings ?
   a. $E - 1 = 1 + \Delta$ b. $E = 1 + \nabla$
   c. $E = 1 + \Delta$ d. $E = 1 - \Delta$

2. $E\nabla = \nabla E = \cdots \ldots$
   a. ∇ b. Δ
   c. a or b d. a and b

3. 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 backward Difference
   c. Newton's Divided Difference d. Lagrange

4. The Delta of power one is called the ____order difference operator
   a. First b. Second
   c. Third d. Fourth

5. What is the value of $E^{-1} =$
   a. Δ b. $1 + \Delta$
   c. ∇ d. $1 - \nabla$

6. $E^{-2} f(x + h) =$ _____
   a. $f(x + 2h)$ b. $f(x - 2h)$
   c. $f(x - h)$ d. $f(x + h)$

7. 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

8. $(\Delta\nabla) f(x) =$ _____
   a. $(\Delta - \nabla) f(x)$ b. $(\Delta + \nabla) f(x)$
   c. $\Delta f(x)$ d. $\nabla f(x)$

9. Principal minor of $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ is

a. (1)

b. $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

c. $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

d. All of these

10. System of solution of the Gause Jordon method of linear simultaneous equations are

a. linear simultaneous equations convert to a lower triangular matrix

b. linear simultaneous equations convert to a diagonal matrix

c. linear simultaneous equations convert to a upper triangular matrix

d. None of these

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Descriptive

Time : 1 hr. 15 mins.

Marks:25

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

1. a. $\Delta \log f(x) = \log\{1 + \frac{\Delta f(x)}{f(x)}\}$

   b. $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$

   $2\frac{1}{2} \times 2 = 5$

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

   $5 + 5 = 10$

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

   Estimate the population for the year 1975

   b. Show that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{(1 + \frac{\delta^2}{4})}$

3. a. Use the Trapezoid rule to approximate with $n = 6$ to evaluate $\int_0^1 \frac{x dx}{1+x}$ and estimate the error in the results.

   $6 + 4 = 10$

   b. Use the Simpson's $\frac{1}{3}$rule to approximate with $n = 6$ to evaluate $\int_0^6 \frac{dx}{1+x}$

4. **a.** Solve the following linear equations by LU method or factorization method **7 + 3 = 10**

$$x_1 + x_2 + x_3 = 1$$
$$4x_1 + 3x_2 - x_3 = 6$$
$$3x_1 + 5x_2 + 3x_3 = 4$$

b. Apply and solve the following linear equations by Gauss elimination method

$$x + 4y - z = -5$$
$$x + y - 6z - 12$$
$$3x - y - z = 4$$

5. **a.** The integers $0, 1, 1, 2, 3, 5, 8, 13, 21, \ldots..$are said to form a Fibonacci sequence. Form the Fibonacci difference equation and solve it **7 + 3 = 10**

b. Solve $u_{n+2} - 2u_{n+1} + u_n = 0$

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