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

Duration: 1:30 hrs.

Full Marks: 35

(**Objective**)

Time: 15 mins.

Marks: 10

Choose the correct answer from the following:

1X10=10

1. Select the correct answer of the following $\Delta = ?$

   a. $E - 1$

   b. $1 - E$

   c. $\nabla - \Delta$

   d. All of the above

2. Which one of the following results is correct δ

   a. $E^{\frac{1}{2}} + E^{-\frac{1}{2}}$

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

   c. $E^{\frac{1}{2}} - E^{-\frac{1}{2}}$

   d. None of the above

3. Which one of the following results is correct for the derivative of

   $f(x) = 3x^3 - 2x + 1$

   a. $3x^2$

   b. $9x^2$

   c. $9x^2 - 2$

   d. None of these

4. The relationship between the operators E and D is

   a. $E = e^{hD}$

   b. $\delta = e^{h-D}$

   c. $E = e^{\delta+D}$

   d. None of these

5. The relationship between the operators μ and E is -------

   a. $\frac{1}{2}(E^{\frac{1}{2}} - E^{-\frac{1}{2}})$

   b.

   $E^{\frac{1}{2}} - E^{-\frac{1}{2}}$

   c. $\frac{1}{2}(E^{\frac{1}{2}} + E^{-\frac{1}{2}})$

   d.

   None of these

6. In solving simultaneous equation by Gauss-Jordon method, the coefficient matrix of the system is

a. lower triangular matrix

b. diagonal matrix

c. upper triangular matrix

d. none of these

7. The order of convergence in Newton- Raphson's method is

a. 5

b. 4

c. 3

d. 2

8. In the case of Bisection method , the convergence is

a. linear

b. quadratic

c. very slow

d. all of these

9. The Newton- Raphson's method fails when

a. $f^1(x)$ is negative

b. $f^1(x)$ is positive

c. $f^1(x)$ is zero

d. None of these

10. The relationship between the operators Δ and ∇ is -------

a. $(1 + \nabla)^{-1} - 1$

b. $(1 - \nabla)^{-1} + 1$

c. $(1 - \nabla)^{-2} - 1$

d. $(1 - \nabla)^{-1} - 1$

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(__Descriptive__)

Time : 1 hr. 15 min.   Marks : 25

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

1. Evaluate $\Delta^2 \left(\frac{5x+12}{x^2+5x+6} \right)$, assuming $h = 1$ 5

2. a. Evaluate the formula to find $\sqrt[k]{N}$ of x_{n+1} by Newton Raphson method   5+5=10
   b. Evaluate the iterative formula by using Newton Raphson's method of cube root of 17 to the tree decimal places

3. a. Apply Gauss –Jordan method to solve the equation   4+6=10
   $$x + y + z = 9$$
   $$2x - 3y + 4z = 13$$
   $$3x + 4y + 5z = 40$$

   b. Apply factorization method to solve the equations
   $$3x + 2y + 7z = 4$$
   $$2x + 3y + z = 5$$
   $$3x + 4y + z = 7$$

4. a. Solve the difference equation $y_{n+2} - 4y_{n+1} - 3y_n = 5^n$ 3+7=10
   b. Using Picard's method of successive approximations, obtain a solution upto the fifth approximation of the equation $\frac{dy}{dx} = y + x$, such that $y = 1$ when $x = 0$. Check the answer by finding the exact particular solution.

5. a. Solve $\frac{dy}{dx} = y + x$, $y(0) = 1$ by Taylor's series method. Hence find the values of y at $x = 0.1$ and $x = 0.2$ 7+3=10
   b. Evaluate $\Delta \left(\frac{x^2}{\cos 2x} \right)$

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