

Roll No.

Total No. of Pages : 03

Total No. of Questions : 07

M.Sc. (Mathematics) (2018 Batch) (Sem.-2)

NUMERICAL ANALYSIS

Subject Code : MSM-205-18

M.Code : 75966

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **FIVE** questions carrying **TWO** marks each.
2. **SECTION - B & C.** have **THREE** questions each.
3. Attempt any **FOUR** questions from **SECTION B & C** carrying **FIFTEEN** marks each.
4. Select atleast **TWO** questions from **SECTION - B & C** each.

SECTION-A

1. Write short notes on :

- Define the terms Rounding and Chopping.
- Define convergence of iteration methods.
- Evaluate $\left(\frac{\Delta^2}{E}\right)x^3$.
- Evaluate the integral $I = \int_0^1 \sqrt{1-x^2} dx$ taking $h = 0.25$ using Simpson's Rule.
- Describe initial value and boundary Value problems.

SECTION-B

2. a) Obtain the rate of convergence of Newton-Raphson's method.

b) Solve the following system of equations using Gauss-Jordan method.

$$4x - 5y - 2z = 16.8$$

$$-5x + y + 4z = 7.4$$

$$3x - 2y + z = -0.7$$

3. a) Solve the following equations, correct upto two decimal places using Gauss-Jacobi method.

$$-4x + y + 10z = 21$$

$$2x + 8y - z = -7$$

$$5x - y + z = 14.$$

b) Find the positive root of the equation $x^2 - 6e^{-x} = 0$, by Regula – falsi method correct upto two places of decimal.

4. a) Use Muller's Method to find the zeros, real or complex of the polynomial $x^7 - 1$.

b) Using Power Method find the dominant latent root and associated latent vector of the matrix.

$$A \text{ where } A = \begin{vmatrix} 5 & 10 \\ 2 & 6 \end{vmatrix}$$

SECTION-C

5. a) Values of \log_e^x are tabulated below for $x = 1.25(0.25) 2.50$:

X	1.25	1.50	1.75	2.00	2.25	2.50
\log_e^x	0.2234	0.4055	0.5596	0.6932	0.8109	0.9163

Compute the value of \log_e^x at $x = 1.70$ and 2.15 using Stirling's formula.

Use upto 4th term in the formula.

- b) Find the solution of the following differential equation by Taylor's series method so that the truncation error is no greater than $\frac{1}{2} \times 10^{-4}$ for $x \leq 0.2$,

$$\frac{d^2y}{dx^2} + x \frac{dy}{dx} = y=0; y(0) = 0, y'(0) = 1$$

6. a) Evaluate the integral $I = \int_0^2 \sqrt{1+4x}$, by Simpson's Rule with two intervals and Simpson's Rule with four intervals. Compare the result with exact value and explain the difference in computer values.
- b) Solve the differential equation $\frac{dy}{dx} = x^2 + y^2 - 2$, for $x = 0.3$, by Milne's predictor corrector method.

Compute the starting values at $x = -0.1, 0, 0.1, 0.2$ by Taylor's expansion about $x = 0$ where $y(0) = 1$, taking first four non-zero terms. Show your calculations upto four decimals only.

7. a) Solve the differential equation $y'' = xy$, for $x = 0.5$ in a single step, using Runge-Kutta fourth order method when the initial conditions are given to be $y(0) = 0$ and $y'(0) = 1$.
- b) Following values of the function $y = x^3$ are provided

X	0	1	2	3
Y	0	1	8	27

Compute cube root of 21 from the above data using Lagrange's method. Discuss the error in the result.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.