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

Date of Examination : 14-07-22

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 &Ceach.**

SECTION-A

1. Write short notes on :

a) Define order of convergence of iteration method.

b) Define eigen values and eigen vectors.

c) Show that $\Delta\nabla = \nabla\Delta = \Delta - \nabla - \delta^2$.

d) Evaluate the integral $1 = \int_0^1 \sqrt{1 - x^2}\ dx$ taking $h = 0.25$, by trapezoidal Rule.

e) Explain the terms order and stability of a numerical method.

SECTION-B

2. a) Obtain the rate of convergence for Secant method.

b) Solve by Gausselimination method the following system of equations :

$5x + 2y + 4z = 24$

$3x + y + 7z = 18$

$8x + 4y + 5z = 41$

3. a) Solve the following equations, correct upto two decimal places,by Gauss - Seidal method :

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

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

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

b) Find the positive root of the equation $x^3 - 2x - 8 = 0$, by Bisection method correct upto two places of decimal.

4. a) Show only one iteration of Bairstow's method to find quadratic factor $x^2 + px + q$ of the polynomial $x^4 - 5x^3 + 13x^2 - 19x + 10$. Take the initial values of p and q as $p_0 = -2.8$ and $q_0 = 1.5$. Compute p_1 and q_1.

b) Compute the numerically largest eigen value and the corresponding eigen vector of the following matrix A by Power method.

$$A = \begin{bmatrix} 5 & -2 & 0 \\ 1 & 2 & -3 \\ 1 & -2 & 4 \end{bmatrix}$$

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
$\log_e$*	0.2234	0.4055	0.5596	0.6932	0.8109	0.9163

Compute the values of $\log_e x$ at $x = 1.70$ and 2.15 using Bessel's formula.

Use upto 4th term in the formula.

b) Find the approximate solution by Picard's method for the differential equation, $\frac{dy}{dx} = x^2 - y,\ y(0) = 1$ which is correct within an accuracy of 10^{-3} for $0 < x < 0.2$.

6. a) Evaluate the integral I $\int_0^2 \sqrt{1+4x}$, by Gaussian 3-point formula. Compare the result with exact value.

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) Compute y at $x = 0.2\ (0.2)\ 0.4$ by using fourth order Runge - Kutta method from the differential equation $\frac{dy}{dx} = y - x, y(0) = 1.5$. Give your answer upto four places of decimal.

b) Compute $I = \int_0^1 e^{2x} dx$ by Romberg integration method correct upto three decimal places, using Trapezoidal rule.

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.