Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Sc. (Non-Medical) (Sem.–5)

NUMERICAL ANALYSIS

Subject Code : BSNM-506-18

M.Code : 78620

Date of Examination : 04-01-23

Time : 3 Hrs. **Max. Marks : 50**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying ONE mark each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Write the steps of Gauss elimination method for solving system of linear equations.

b) What do you mean by interpolation?

c) State eigenvalue problem.

d) When do we use power method?

e) Discuss the concept of numerical differentiation.

f) When do we stop the iterations in power method?

g) Write the formula of Simpson's l /3-rule for numerical integration.

h) Discuss drawback of Taylor series method for solving initial value problems of ODEs.

i) Write the formula of Runge-Kutta method of fourth order.

j) What is the difference between one-step methods and linear multi-step methods for solving initial value problems of ODEs?

SECTION-B

2. Solve the following system of equations using Gauss elimination method

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

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

$$x - y + z = 6$$

3. Find the largest eigenvalue in magnitude and the corresponding eigenvector of the following matrix using power method

$$\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$

4. a) Discuss the disadvantage of Lagrange interpolation.

   b) The following table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface:

x = height	100	150	200	250	300	350	400
y = distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

   Find the value of y when x = 218 ft.

5. Using Trapezoidal rule, evaluate $\int_{-1}^{1} \frac{1}{1+x^2} dx$ using 8 intervals. Also compare the result with the actual value of the integral.

6. Given that $y' = y^2 + x$, $y(0) = 1$, use third order Taylor series method to compute $y(0.1)$ and $y(0.2)$.

SECTION-C

7. a) Solve the following system of equations using Gauss-Seidel method :

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

b) Find y′(0) and y″(0) from the following table :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

8. a) Use fourth order Runge-Kutta method to find $y(0.2)$, given that

$$\frac{dy}{dx} = 3x + y^2 ;\ y(0) = 1 \text{ with } h = 0.1 \text{ (step-szie)}$$

b) Given that $\frac{dy}{dx} = x + \sin y;\ y(0) = 1,$ compute $y(0.2)$ and $y(0.4)$ with $h = 0.2$ (step-size) using Euler method.

9. a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 3/8-rule.

b) Discuss the disadvantages of Simpson's 3/8-rule compared with Simpson's 1/3 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.