Sr. No. 323502

December 2023
B.Sc. - V SEMESTER
Numerical Methods (BMH-502A)

Time: 3 Hours

Max. Marks:75

Instructions:
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.
4. Scientific calculator can be used

PART -A

Q1 (a) Explain algebraic and transcendental equations with examples. (1.5)

(b) Find the relative error if the number X=0.004997 is truncated to three decimal places. (1.5)

(c) Using Newton's iterative formula establish the iterative formula to calculate the cube root of N. (1.5)

(d) Given that (1.5)

x	1	2	3	4	5
y	2	5	10	17	26

Find $\nabla^2 y_5$.

(e) To prove that $\mu\delta = \frac{1}{2}\Delta E^{-1} + \frac{1}{2}\Delta$ (1.5)

(f) Write the formula of Newton's divided difference interpolation. (1.5)

(g) What is the difference between direct and iterative method of solving simultaneous linear equation. (1.5)

(h) Briefly explain Jacobi method to solve the system of simultaneous equation. (1.5)

(i) Write down the expressions for $\frac{dy}{dx}$ at x=x_n by Newton's backward difference formula. (1.5)

(j) f(x) is given by (1.5)

x	0	0.5	1
f(x)	1	0.8	0.5

Then using Trapezoidal rule, find the value of $\int_0^1 f(x)\,dx$.

PART –B

Q2 (a) Find a real root of the equation $x\log_{10} x = 1.2$ by Regula-Falsi method correct to four decimal places. (7)

(b) Using Newton's iterative method, find the real root of the equation $3x = \cos x + 1$ correct to four decimal places. (8)

Q3 (a) Find the number of men getting wages between Rs. 10 and 15 from the following data:- (7)

Wages in Rs.	0-10	10-20	20-30	30-40
Frequency	9	30	35	42

(b) Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for (8)

X	0	1	2	5
$f(x)$	2	3	12	147

Q4 (a) Solve the following system of equations (7)

3x+9y-2z=11

4x+2y+13z=24

4x-4y+3z=-8

by using Relaxation method.

(b) Apply LU Decomposition method to solve the following system of equations:- (8)

3x+2y+7z=4

2x+3y+z=5

3x+4y+z=7.

Q5 (a) From the following table of values of x and y, (8)

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at (a) x=1.1 (b) x=1.6

(b) Given that (7)

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
logx	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate $\int_{4}^{5.2} \log x \, dx$, by using Simpson's 1/3rd rule and Weddle rule.

Q6 (a) Using iteration method to find a root of the equation $x^3 - 9x + 1 = 0$ correct up to four decimal places. (7)

(b) A thermocouple gives the following output for rise in temperature (8)

Temp (^{0}C)	0	10	20	30	40	50
Output (mV)	0.0	0.4	0.8	1.2	1.6	2.0

Find the output of the thermocouple for 37^0C temperature using Newton's Divided Difference formula.

Q7 (a) Solve the equations (7)

27x+6y-z=85

x+y+54z=110

6x+15y+2z=72

by using Gauss-Seidel method.

(b) The velocity v(km/min) of a moped which starts from rest, is given at fixed intervals of time t (min) as follows: (8)

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes.