GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Fourth Semester - Regular) Examinations, April – 2025

23BCHPC24004 – Numerical Methods in Chemical Engineering

(Chemical Engg.)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right-hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What is the Newton -Raphson Method.	CO1	K1
b. Define Upper Triangular Matrix with an example.	CO2	K1
c. Find the Lagrange's interpolating polynomial of the Data f (0) =1, f (1) =3, f (3) =55	CO3	K2
d. What are the Disadvantages of multistep methods?	CO4	K1
e. Define Difference Quotient.	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Solve the system x+y+2z=4, 2x-y+3x=9, 3x-y-z=2 by LU Decomposition Method.	5	CO1	K2
b. Find a real root of $x^3 - x - 1 = 0$, by Fixed Point Iteration Method	5	CO1	K2
(OR)			
c. Solve 10x+2y+z=9, x+10y-z=-22, -2x+3y+10z=22 By Gauss -Seidel Method.	10	CO1	K2
3.a. Using the following data, Estimate the value of f(-0.5) & f(0.5) by Hermite Interpolation.	10	CO2	K2

x	f(x)	$f^1(x)$
-1	1	-5
0	1	1
1	3	7

(OR)

b. Obtain the piecewise linear interpolation for the function f(x). Also find f (7).	5	CO2	K3

X	1	2	4	8
Y=f(x)	3	7	21	73

c. Find the Lagrange's quadratic interpolating polynomial for the data,	5	CO2	K3

x	0	1	3
y	1	3	5.5

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4.a. From the following table find $f^{I}(3)$ by using By Richardson's extrapolation.	5	CO3	K3

x	-1	1	2	3	4	5	7
F(x)	1	1	16	81	251	625	2401

b.	Find the Jacobian matrix for the following system $F_1 = x^2+y^2-x = 0$ $F_2 = x^2-y^2-y = 0$ at point (2,2) with h=k=1.	5	CO3	K3
	(OR)			
c.	Evaluate I=$\int_0^1 \frac{1}{1+x}$ dx by Simpson's rule & Romberg's Method with n=10	5	CO3	K3
d.	Find $f^1(\prod/4)$ with h= $(\prod/12)$ Given f(x) = sinx, by using Backward difference formula	5	CO3	K3
5.a.	Evaluate y (2), if y(x) is the solution of $y^1(x)= (x+y)$ given y (0) =1 by using Adams Moulton method of 3rd order	5	CO4	K3
b.	Evaluate y (2), given $y^1(x)= 0.5 (x+y)$ & y (0) =2 by Adams Bash forth method of order 4.	5	CO4	K3
	(OR)			
c.	Estimate y (0.4), for the initial value problem $y^1 = -2xy^2$ & y (0) =1 by Adams bash- forth predictor –corrector formula	5	CO4	K3
d.	Using Runge –Kutta Method (R-K method) find y (0.2), Given $y^1 = x + y$, $y(0) = 1$	5	CO4	K3
6.a.	Solve $U_{xx} = U_t$ given U (0, t) = 0 & U (1 t) = t & U(x,0) =sinπx. By Bender-Schmidt formula. find the values of U up to t=5. assume h=k=1	5	CO5	K3
b.	Explain about the Method of solution for Laplace Equation.	5	CO5	K3
	(OR)			
c.	Solve the equation $U_{xx} = U_t$ subject to U (x,0) =0, U (0, t) = 0 & U (1, t) =t for two-time steps with h=1, by Crank –Nicholson Method.	5	CO5	K3
d.	Solve $4U_{xx} = U_t$ .Given u (0, t) =0; u (4, t) =0 with initial condition u(x,0) =x(4-x) and $u_t(x,0)$ =0; Assume h=1/4, find the values of u up to one step in t.	5	CO5	K3

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