QP Code: R264A026 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fourth Semester – Regular/Supplementary) Examinations, April 2026

23BCHPC24004 – Numerical Methods in Chemical Engineering
(Chemical Engineering)

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.	Write a formula for the Newton–Raphson method	CO1	K1
b.	Explain about piecewise linear interpolation	CO2	K2
c.	What is the Romberg integration method?	CO3	K1
d.	What are the Advantages of multistep methods?	CO4	K1
e.	Explain parabolic partial differential equation with one example	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	Find a real root of $x^3 + x - 5 = 0$, correct up to four decimals by Bisection method for five iterations.	5	CO1	K3
b.	Find a real root of $x^3 - x - 1 = 0$, by Fixed Point Iteration Method .	5	CO1	K3
	(OR)			
c.	Solve the system x+y+2z=4 2x-y+3x=9 3x-y-z=2 by LU decomposition method	10	CO1	K3
3.a.	Using the following data, Estimate the value of f (1.5) & f (0.5) by Hermite Interpolation.	10	CO2	K3

x	f(x)	$f^1(x)$
0	4	-5
1	-6	-14
2	-22	-17

(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

4.a. Find f '(0) from the following data by using by Richardson's extrapolation. 10 CO2 K3

x	0	1	2	3	4	5	6	7	8
f(x)	-5	-2	7	34	91	190	343	562	859

(OR)

b. Evaluate $\int_0^1 \frac{1-x}{1+x}$, by Trapezoidal rule with 10 number of intervals. 5 CO3 K3

c. Find the Jacobian Matrix for the following system of the equations. 5 CO3 K3
$F_1(x, y) = x^2 + y^2 - x = 0$ & $F_2(x, y) = x^2 - y^2 - y = 0$ at point (2,2) with h=k=1

5.a. Find y (0.4) by Improved Euler's method given y '=(x+y) and y (0) =1. 5 CO4 K3

b. Estimate y (0.4) for the initial value problem $y' = -2xy^2$ & y (0) =1.by Adams bash- forth method of order 4. 5 CO4 K3

(OR)

c. Estimate y (0.4) for the initial value problem $y' = -2xy^2$ & y (0) =1 by Adams bash- forth predictor –corrector formula 5 CO4 K3

d. Find y (0.4) and y (0.5) by Milne-Simpson Formula. given $y' = xy + y^2$ and 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 CO6 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 one -time step, with h=1 by Crank –Nicholson Method. 5 CO5 K3

d. Solve $4U_{xx} = Utt$ .given U (0, t) =0; U (4, t) =0 with initial condition U (x,0) =x(4-x) and $U_t(x,0) = 0$; find the values of u for five steps in t. 5 CO6 K3

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