QP Code: RM22BTECH205 | Reg. No | | | | | | | | | | | AY 22

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester Regular) Examinations, May – 2024

22BCHPC24004 – Numerical Methods in Chemical Engineering

(Chemical)

Time: 3 hrs | Maximum: 70 Marks

(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 Interpolation?	CO1	K1
b. Write a formula for Newton –Raphson method.	CO1	K1
c. Define initial value problem with an example.	CO3	K1
d. What is the disadvantage of multistep Method?	CO3	K2
e. What is standard five point formula.	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. Find the real root of $x^3 + x - 5 = 0$, correct up to four decimals by Iteration method for five iterations.	8	CO1	K3
b. Find a real root of $x^3 - x - 1 = 0$, by Newton –Raphson Method.	7	CO1	K3
(OR)			
c. Solve the system 3x-6y-3z=-3 2x+6z=-22 -4x+7y+4z=3 by LU decomposition method.	8	CO1	K3
d. Find a real root of $x^3 + x - 5 = 0$, upto four significant figure by Bisection Method.	7	CO1	K3
3.a. Evaluate I=$\int_0^1 \frac{1}{1+x}$ dx by Trapezoidal rule & Romberg's method with n=10	8	CO2	K3
b. Given f(x) = cosx, Find $f^1(\prod/4)$ with h=($\prod$/12) by using backward difference formula.	7	CO2	K3
(OR)			
c. Using the following data, Estimate the value of f (-0.5) & f (0.5) by Hermite interpolation.	8	CO2	K3

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

d. Find the Jacobian matrix for the system. $F_1 = x^2+y^2-x = 0$; $F_2 = x^2-y^2-y = 0$ at point (2,2)	7	CO2	K3
4.a. Evaluate y (2), if y(x) is the solution of $y^1(x)= (x+y)$ given y (0) =1 by using R-k method and Milne's Predictor /Corrector Formula.	8	CO3	K3
b. Given the initial value problem $y^1 = -2xy^2$ & y (0) = 1. Estimate y(0.4) by Adams bash- forth method of order 4.	7	CO3	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.	8	CO3	K3
d.	Using Runge –kutta method (R-K METHOD) y(0.2) and y(0.4)given $y^1 = x + y, y(0) = 1.$	7	CO3	K3
5.a.	Solve $\nabla^2 U = -10(x^2 + y^2 + 10)$,over the square mesh with sides x = 0 and y = 0,x = 3,y = 3 with u = 0 on the boundary and mesh length is 1 unit.	8	CO4	K3
b.	Solve $U_{xx} = U_t$ given U (x,0) = 0 ; U (0,t) = 0 & U (1,t) = t & U(x,0) = x(x-4).find the values of U up to t = 5 assume h = k = 1.	7	CO4	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 , by CRANK –NICHOLSON METHOD	8	CO4	K3
d.	Solve Uxx = 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 = 4. Assume h = 1	7	CO4	K3

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