QP Code: RD18001053 Reg. No | | | | | | | | | | AR 18

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, December – 2020

(Fifth Semester)

BCHPE5042 – ADVANCED NUMERICAL METHODS

(Chemical Engineering)

Time: 2 hrs Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (1 x 10 = 10 Marks)

Q.1. Answer ***ALL*** questions [CO#] [PO#]

a. For decreasing the number of iterations in Newton Raphson method: CO1 PO1

(i) The value of f’(x) must be increased (ii) The value of f’’(x) must be decreased

(iii) The value of f’(x) must be decreased (iv) The value of f’’(x) must be increased

b. Number of iteration depends on the _________ CO1 PO3

(i) Initial value taken to start the iteration (ii) Type of linear equations

(iii) Number of unknowns (iv) Approximations to be done

c. A function is given by $x – e^{-x} = 0$. Find the root between a = 0 and b = 1 by using Bisection method. CO1 PO2

(i) 0.655 (ii) 0.665

(iii) 0.565 (iv) 0.656

d. Newton- Gregory Forward interpolation formula can be used _____________ CO2 PO3

(i) only for equally spaced intervals (ii) only for unequally spaced intervals

(iii) for both equally and unequally spaced intervals (iv) for unequally intervals

e. Romberg's method is also known as__________. CO2 PO2

(i) Trapezoidal rule (ii) Simpson's (1/3)rd Rule

(iii) Simpson's (3/8)th Rule (iv) Romberg’s Integration

f. Numerical differentiation can be used only when the difference of some order are CO2 PO2

(i) equally spaced (ii) unequally spaced

(iii) constant (iv) closed

g. In Euler's method: Given initial value problem y'=dy/dx=f(x, y) with $y(x_0) = y_0$, then approximation is given by_______. CO3 PO1

(i) $y_{n+1}=y_n+hf(x_{n-1}, y_{n-1})$ (ii $y_{n+1}=y_n+hf(x_n, y_n)$

(iii) $y_{n+1}=y_n+hf(x_{n-1}, y_n)$ (iv) $y_{n+1}=y_n+hf(x_n, y_{n-1})$

h. Taylor's series method will be very useful to give some initial starting values for powerful methods such as _________. CO3 PO3

(i) Euler Method (ii) Modified Euler Method

(iii) Newton Raphson Method (iv)RungeKutta Method

i. The partial differential equation $5\frac{\partial^2 z}{\partial x^2} + 6\frac{\partial^2 z}{\partial y^2} = xy$ is classified as CO4 PO4

(i)Elliptic (ii)Parabolic
(iii)Hyperbolic (iv)None of these

j. For solving one dimensional heat equation using Bender-Schmidt the value of λ is — CO4 PO4

(i) $\frac{k}{ah^2}$ (ii) $\frac{h}{ak^2}$
(iii) $\frac{k}{ah}$ (iv) $\frac{h}{ak}$

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

<u>Q.2. Answer ***ALL*** questions</u>

	Question	[CO#]	[PO#]
a.	Evaluate $\sqrt{15}$ using Newton – Raphson formula.	CO1	PO3
b.	State Newton's formula on interpolation. When it is used?	CO2	PO3
C.	Evaluate $\int_{1/2}^{1} \frac{1}{x} dx$ by trapezoidal rule dividing the range into 4 equal parts	CO2	PO1
d.	What are multi-step methods? How are they better than single step methods?	CO3	PO2
e.	Classify the following equation: $\frac{\partial^2 u}{\partial x^2}+4\frac{\partial^2 u}{\partial x\partial y}+4\frac{\partial^2 u}{\partial y^2}-\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0$	CO4	PO4

PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

<u>Answer ***ANY FIVE*** questions</u>

	Question	Marks	[CO#]	[PO#]
3.	Find a root of $x \log_{10} x - 1.2 = 0$ using Newton Raphson method correct to 3 decimal places.	(6)	CO1	PO2
4.	Solve the following equation by Gauss Elimination method $10x-2y+3z=23, 2x+10y-5z=-33, 3x-4y+10z=41$	(6)	CO1	PO2
5.	Find the polynomial f(x) by using Lagrange's formula and hence find f(3) for x : 0 1 2 5 f(x) : 2 3 12 147	(6)	CO2	PO2
6.	Evaluate $\int_0^1 \frac{dx}{1+x}$ and correct to 3 decimal places using Romberg's method and hence find the value of $\log_e 2$.	(6)	CO2	PO3
7.	Using R.K.Method of order 4, find y for x = 0.2 given that $\frac{dy}{dx}=xy+y^2, y(0)=1$	(6)	CO3	PO2
8.	Apply modified Euler's method to find y(0.2) and y(0.4) given $y' = x^2+y^2$,y(0)=1 by taking h=0.2.	(6)	CO3	PO1
9.	Solve $\frac{\partial^2 u}{\partial x^2}=\frac{\partial u}{\partial t}$ given u(0,t)=0, u(5,t)=0, u(x,0)=$x^2(25-x^2)$,ind u in the range taking h=1 upto 3 seconds using Bender- Schmidt recurrence equation	(6)	CO4	PO4
10.	Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ subject to the condition u(x,0)=sinπx,0≤x<1;u(0,t)=u(l,t)=0 using Crank-Nicolson method.	(6)	CO4	

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