GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
NUMERICAL METHODS
M(FT)401

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	Newton Raphson method fails when (a) f'(x)=1 (b) f'(x)= -1 (c) f'(x)=0 (d) None of These	1	CO1
	(ii)	Which of the following relation is false (a) $\Delta-\nabla\equiv\Delta\nabla$ (b) $E^{-1}\equiv \mathrm{I}-\nabla$ (c) $\Delta+\nabla\equiv\Delta/\nabla$ (d) None of These	1	CO1
	(iii)	Bisection method fails when (a) f(a)f(b)=0 (b) f(a)f(b)<0 (c) both (a) and (b) (d) None of These	1	CO2
	(iv)	Gauss Seidel method is (a) direct method (b) indirect method (c) iterative method (d) None of These	1	CO1
	(v)	Gauss Elimination method is (a) direct method (b) indirect method (c) iterative method (d) None of These	1	CO1
	(vi)	In Trapezoidal rule of finding $\int_a^b f(x)\,dx$, f(x)is approximated by (a) linear segment (b) parabola (c) circular sector (d) part of ellipse	1	CO1

(vii) In Simpson's $1/3^{rd}$ rule of finding $\int_a^b f(x)\,dx$, f(x)is approximated by — 1 CO1
(a) linear segment
(b) parabola
(c) circular sector
(d) part of ellipse

(viii) An other name of Regula- Falsi method is — 1 CO1
(a) Tangent method
(b) Root method
(c) Method of False position
(d) None of These

(ix) Round off to the 4 significant digits of the number 7.103531 — 1 CO2
(a) 7.103
(b) 7.104
(c) 7.105
(d) none of these

(x) Degree of precession of Trapezoidal Rule of Integration is — 1 CO1
(a) 1
(b) 2
(c) 3
(d) 4

(xi) $\Delta(\frac{1}{x})$ is equal to — 1 CO2
(a) $\frac{1}{x(x+h)}$
(b) $\frac{1}{x+h}$
(c) $-\frac{h}{x+h}$
(d) $-\frac{h}{x(x+h)}$

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

		Marks	CO No.
2.	Find $f(1.02)$ by Newton's forward interpolation formula from the table	5	CO3

x	1.00	1.10	1.20	1.30
f(x)	0.8415	0.8912	0.9320	0.9636

3. Evaluate $\int_1^3 \frac{xdx}{x^2+3}$ by Simpson's 1/3 rule, taking 6 equal subintervals — 5 — CO2

4. Solve the differential equation by Euler method $\frac{dy}{dx} = (1-y), y(0) = 0$ at x=0.1, 0.2. — 5 — CO3

5. Write down the approximate representation of $\pi(=\frac{22}{7})$ correct to four significant figures and the find absolute error, relative error, relative percentage error. — 5 — CO2

6. Using the following table, find find $f(3.5)$ correct upto two decimal places.. — 5 — CO3

x	0	1	2	3	4
f(x)	41	43	47	53	61

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

		Marks	CO No.
7. a)	From the following table, find by Lagrange's formula, the value of y when x=102.	8	CO2

x	93.0	96.2	100.0	104.2	108.7
y	11.38	12.80	14.70	17.07	19.91

b) Compute one root of $\sin x = 10(x-1)$, correct to two decimal places by Regula Falsi method. — 7 — CO2

8.a) For finding the square root of 'a'($a>0$), derive the Newton Raphson iteration formula $x_{n+1} = \frac{1}{2}(x_n + \frac{a}{x_n}), n = 0,1,2,3,....$ Hence find $\sqrt{2}$, correct to five significant figures. — 7 — CO3

b) Solve by Euler's modified method the following differential equation for x=0.02 taking step length h=0.01, $\frac{dy}{dx} = x^2 + y$, y=1 when x=0. — 8 — CO3

9.a) Compute $y(0.4)$ by Runge Kutta method of fourth order for the differential equation $\frac{dy}{dx} = xy + y^2, y(0) = 1$, taking h=0.1 — 8 — CO2

b) Estimate the value of f(1.5) &f(7.5) using Newton's forward & backward interpolation formula respectively from the following data: — 7 — CO3

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

10.a) Apply Newton's divided formula to compute the value of y for x=0.72, from the following table correct to six decimal places. 7 CO3

x	0.62	0.68	0.70	0.73	0.75
y=f(x)	0.6604918	0.7336304	0.7585837	0.7965858	0.8223167

b) Solve the system of equations by Gauss Seidel method: 8 CO3

$$10x-5y-2z=3$$
$$4x-10y+3z=-3$$
$$x+6y+10z=-3$$

Correct to four significant figures.

11.a) Solve the system of equations by Gauss Elimination method: 5 CO2

$$3x_1+9x_2-2x_3=11$$
$$4x_1+2x_2+13x_3=24$$
$$4x_1-2x_2+x_3=-8$$

Correct to four significant figures.

b) Compute one positive root of $x+\ln x-2=0$, correct to four decimal places by method of Newton Raphson. 5 CO2

c) Compute $y(1.3)$ by Runge Kutta method of fourth order for the differential equation $\frac{dy}{dx}=xy, y(1)=1$, taking h=0.1 5 CO2