GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

NUMERICAL METHODS AND STATISTICS

M(IT)302

TIME ALLOTTED: 3 HOURS **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)	Mode of 2,2,3,4,1,2,3,4,2,2,2,4,3,1,4,1,2,3,3,2,2,2 (a) 2 (b) 1 (c) 3 (d) 4	1	CO1
	(iii)	Number of significant digits of 12356.1010 is (a) 4 (b) 7 (c) 3 (d) 8	1	CO2
	(iv)	The percentage error for approximation of 4/3 to 1.3333 is (a) 0.0025% (b) 25% (c) 0.000025% (d) 0.25%	1	CO1
	(v)	Product of regression coefficients is (a) 1 (b) -1 (c) 0.5 (d) ρ^2	1	CO3
	(vi)	Degree of precision of Simpson's 1/3rd Rule of Integration is (a) 1 (b) 2 (c) 3 (d) 4	1	CO1

(vii)	Lagrange Interpolation formula is applicable if nodes are (a) Equispaced (b) Un equispaced (c) Both equispaced and un equispaced (d) None of these	1	CO2
(viii)	Trapezoidal rule of integration is applicable when the number of equal subintervals is (a) Even (b) Odd (c) Both even and odd (d) None of these	1	CO1
(ix)	Correlation Coefficient lies in (a) [-1,1] (b) [0,1] (c) [0,2] (d) None of these	1	CO1
(x)	Euler method for ODE has a truncation error of the order of (a) h^3 (b) h^6 (c) h^2 (d) h^5	1	CO1
(xi)	δ^2 is equivalent to (a) $\Delta\nabla$ (b) Δ/∇ (c) $\Delta+\nabla$ (d) None of these	1	CO3
(xii)	Gauss Elimination method is (a) direct method (b) indirect method (c) iterative method (d) None of These	1	CO1

GROUP – B*
(Short Answer Type Questions)
Answer any *three* from the following: 3×5=15

		Marks	CO No
2.	Use Newton Raphson method to compute $\sqrt[4]{23}$, correct to 3 decimal places.	5	CO3
3.	Prove that $\Delta \log f(x) = \log\left[1+\frac{\Delta f(x)}{f(x)}\right]$	5	CO2
4.	Do these two lines $2x+3y=7$ and $3y-7x-2=0$ as the regression lines? Give reasons.	5	CO2
5.	Evaluate $\int_0^1 \frac{dx}{x^2+1}$ by Simpson's $1/3^{rd}$ rule of integration, taking 6 equal subintervals and hence find the value of π correct to 3 decimal places. ,	5	CO3

6. Find correlation coefficient from the following table — 5 — CO3

$$\begin{bmatrix} x & 1 & 2 & 3 & 4 \\ y & 3 & 6 & 9 & 11 \end{bmatrix}$$

GROUP – C*
(Long Answer Type Questions)
Answer any *three* from the following: 3×15=45

			Marks	CO No.
7.	(a)	Solve the system of equations using Gauss Elimination method: $2x + y + z = 3$ $x + 3y + z = -2$ $x + y + 4z = -6$	8	CO3
	(b)	Solve the system of equations using Gauss Seidel method, correct to 2 decimal places: $3x + y + 5z = 13,\ 5x - 2y + z = 4,\ x + 6y - 2z = -1$	7	CO3
8.	(a)	Find the value of $f(2.0)$ correct up to 2 decimal places from the following table (using Newton's Forward Interpolation Formula):	8	CO3

x:	1.9	2.1	2.3	2.5	2.7
$f(x)$	1.35	1.45	1.55	1.59	1.69

	(b)	Compute $y(1.2)$ by Runge Kutta method of fourth order for the differential equation $\frac{dy}{dx} = 2xy, y(1) = 1, take\ h = 0.1$	7	CO3
9.	(a)	Compute one positive root of $x^3 - 2x - 5 = 0$, correct to two decimal places by Regula falsi method.	8	CO3
	(b)	Compute one positive root of $e^x - 3x = 0$, correct to two decimal places by method of bisection.	7	CO3
10.	(a)	Find the regression lines of y on x and x on y for the sample	7	CO3

x	2	4	6	8	10
y	1	10	12	24	31

	(b)	Fit a straight line to the following data	8	CO3

Year	15	16	17	18	19
Productivity in Kg	8	10	12	10	16

Also find the expected production in year 21.

11.	(a)	If the sample observations are 2,4,6,8,10 from an infinite population with variance σ^2, determine an unbiased estimate of σ^2.	8	CO3
	(b)	Prove that the sample mean is unbiased estimator of the population mean.	7	CO3