GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
NUMERICAL METHODS AND STATISTICS (Backlog)
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)   Regula Falsi method fails when   1   CO1
      (a) f'(x)=1
      (b) f'(x)= -1
      (c) f'(x)=0
      (d) None of These

   (ii)   Mode   of   1   CO1
      2,2,3,4,1,2,3,4,2,2,2,4,3,1,4,1,2,3,3,2,2,2,4,3,3,3,3,1,3,3
      (a) 2
      (b) 1
      (c) 3
      (d) 4

   (iii) Number of significant digits of 401000 is   1   CO2
      (a) 3
      (b) 5
      (c) 2
      (d) 1

   (iv)   The percentage error for approximation of 4/3 to 1.3333 is   1   CO1
      (a) 0.0025%
      (b) 25%
      (c) 0.000025%
      (d) 0.25%

   (v)   Product of regression coefficients is   1   CO3
      (a) 1
      (b) -1
      (c) 0.5
      (d) ρ^2

   (vi)   Degree of precision of Simpson's $1/3^{rd}$ Rule of Integration is   1   CO1
      (a) 1
      (b) 2
      (c) 3
      (d) 4

(vii)	Newton's Backward 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)	Simpson's 1/3rd rule of integration is applicable when the number of equal subintervals is (a) (a)Even (b) (b)Odd (c) (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)	Modified Euler method for ODE has a truncation error of the order of (a) h^3 (b) h^6 (c) h^2 (d) None of these	1	CO1
(xi)	δ^2 is equivalent to (a) $\Delta\nabla$ (b) Δ/∇ (c) $\Delta+\nabla$ (d) None of these	1	CO3
(xii)	LU decomposition 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.	(a)	Use Newton Raphson method to compute $\sqrt[4]{31}$, correct to 3 decimal places.	5	CO3
3.	(a)	Prove that $\Delta \log f(x) = \log\left[1+\dfrac{\Delta f(x)}{f(x)}\right]$	5	CO2
4.	(a)	Do these two lines $2x+3y+7=0$ and $3y-7x+2=0$ as the regression lines? Give reasons.	5	CO2

5. (a) Evaluate $\int_0^1 \dfrac{dx}{x^2+1}$ by trapezoidal rule of integration, taking 6 equal subintervals and hence find the value of π, correct to 3 decimal places. **5   CO3**

6. (a) Find correlation coefficient from the following table **5   CO3**

$$\begin{bmatrix} x & 1 & 2 & 3 & 4 \\ y & 3 & 9 & 12 & 17 \end{bmatrix}$$

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: **8   CO3**

$$x_1 + x_2 + 9x_3 = 11$$
$$2x_1 + 13x_2 + 6x_3 = 21$$
$$3x_1 + 2x_2 + 15x_3 = 20$$

   (b) Solve the system of equations using Gauss Seidel method, correct to 2 decimal places: **7   CO3**

$$7x_1 + x_2 + x_3 = 9$$
$$2x_1 + 9x_2 + x_3 = 12$$
$$3x_1 + x_2 + 13x_3 = 17$$

8. (a) Find the value of $f(2.6)$ correct up to 2 decimal places from the following table (using Newton's Backward Interpolation Formula): **8   CO3**

x:	1.9	2.1	2.3	2.5	2.7
$f(x)$	1.30	1.43	1.56	1.62	1.78

   (b) Compute $y(1.2)$ by Runge Kutta method of fourth order for the differential equation $\dfrac{dy}{dx} = 2xy, \; y(1) = 1, \; take \; h = 0.1$ **7   CO3**

9. (a) Compute one positive root of $x^3 - 3x + 2.05 = 0$, correct to two decimal places by Regula falsi method. **8   CO3**

   (b) Compute one positive root of $x^3 - 4x + 3.15 = 0$, 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	2	8	17	19	23

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

Year	15	16	17	18	19
Productivity in Kg	7	11	13	15	22

Also find the expected production in year 21.

11. (a)	From the random sample of size 49 drawn from a normal population of standard deviation 3, find the 99% confidence interval of the population mean. Find the interval if the mean of such a sample is 3. Given that $\int_0^{2.58} \phi(z)dz = 0.495$.	8	CO3
(b)	If X is unbiased estimator of the parameter A, prove that X^2 is biased estimator of A^2.	7	CO3