GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
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	1	CO1
	a) $f'(x)=1$		
	b) $f'(x)=-1$		
	c) $f'(x)=0$		
	d) None of These		
(ii)	Secant method has order of convergence	1	CO1
	a) 2		
	b) 1.62		
	c) 1		
	d) none of these		
(iii)	Number of significant digits of 1235.0000 is	1	CO2
	a) 5		
	b) 4		
	c) 8		
	d) none of these		
(iv)	If each item is increased by 20 then A.M is increased by	1	CO3
	a) 20		
	b) 1.0		
	c) 20.2		
	d) None of these		
(v)	In LU factorization method, coefficient matrix A can be factorized into A=LU where U is	1	CO1
	a) upper triangular matrix		
	b) lower triangular matrix		
	c) identity matrix		
	d) diagonal matrix		
(vi)	Variance of a constant 'x' is	1	CO1
	a) x		
	b) x/2		
	c) 1		
	d) 0		

(vii) Correlation coefficient lies between | 1 | CO1
  a) 0 to 1
  b) 1 to 2
  c) -1 to 0
  d) -1 to 1

(viii) The class having maximum frequency is called | 1 | CO1
  a) Modal class
  b) median class
  c) Mean class
  d) none of these

(ix) Variance of 1,5,6 is | 1 | CO3
  a) 4.32
  b) 5
  c) 4.67
  d) None of these

(x) Geometric Mean of 1,3,9,3 is | 1 | CO3
  a) 2
  b) 3
  c) 81
  d) None of these

(xi) Mode of the given data set: 5,8,12,17,12,12,6,8, 12, and 12 is | 1 | CO2
  a) 8
  b) 12
  c) 6
  d) None of these

(xii) Gauss Seidel method is | 1 | CO1
  a) direct method
  b) indirect method
  c) iterative method
  d) None of These

GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following)   **3 x 5 = 15**

		Marks	CO No
2.	Use Newton Raphson method to compute $\sqrt[4]{27}$, correct to 3 decimal places.	5	CO3
3.	Do these two lines $2x+3y=7$ and $3y-7x-2=0$ represent the regression lines? Give reasons.	5	CO4
4.	Find mean, variance and standard deviation of first n natural numbers.	5	CO3
5.	Compute one root of $\sin x + \cos x = 1$ correct to two decimal places using bisection method. Given that the root lies in [1,2]	5	CO3

6. Find median of the following frequency distribution   5   CO3

Class	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	12	23	8	4	3

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following)   3 x 15 = 45

		Marks	CO No

7. a. Solve the system of equations by Gauss Seidel method, correct to one decimal place: 8   CO3

$$7x_1 + x_2 + x_3 = 9$$
$$2x_1 + 9x_2 + 5x_3 = 16$$
$$3x_1 + 2x_2 + 10x_3 = 15$$

b. Solve the system of equations by Gauss Elimination method: 7   CO3

$$x_1 + x_2 + x_3 = 3$$
$$2x_1 + x_2 + 5x_3 = 8$$
$$3x_1 + 2x_2 + x_3 = 6$$

8. a. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 4 & -1 \end{bmatrix}$ 8   CO3

b. Solve the system of equations by LU factorization method: 7   CO3

$$8x_1 - 3x_2 + 2x_3 = 20$$
$$4x_1 + 11x_2 - x_3 = 33$$
$$6x_1 + 3x_2 + 12x_3 = 36$$

9. a. Compute one positive root of $e^x - 3x = 0$ correct to two decimal places by Regula Falsi method.   8   CO3

b. Compute one root of $3x - \cos x - 1 = 0$ correct to two decimal places using Secant method. Given that the root lies in [0.5, 0.8]   7   CO3

10. a. Find the regression line of y on x for the sample   8   CO3

x	2	4	6	8	10
y	10	11	25	30	38

b. Fit a straight line to the following data   7   CO3

Year	10	11	12	13	14
Productivity in Kg	8	10	12	10	16

Also find the expected production in year 16.

11. a. A population consists of 1,3,4. Consider all possible samples of size two with replacement. Find mean of the sampling distribution of the sample variance and verify the result $E(S^2) = \dfrac{n-1}{n}\sigma^2$. Find the standard deviation of the sampling distribution of variances. 8   CO3

   b. If T is an unbiased estimator of θ, prove that $\sqrt{T}$ is biased estimator of $\sqrt{\theta}$. 7   CO2