GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
NUMERICAL METHODS AND STATISTICS
M(CSE)401

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)	Which of the following is not a computational error? a) truncation error b) round off error c) inherent error d) none of these	1	CO1
	(ii)	Newton Raphson method has order of convergence a) 2 b) 1.62 c) 1 d) none of these	1	CO1
	(iii)	Degree of precession of trapezoidal rule of integration is a) 1 b) 2 c) 3 d) 4	1	CO2
	(iv)	The median of the data 88,72, 33, 29,70, 54, 86, 91, 57, 61 is a) 63.1 b) 65.5 c) 65.5 d) none of these	1	CO3
	(v)	Which of the following is not true (the notations have their usual meanings)? a) $\Delta = E - 1$ b) $\Delta.\nabla = \Delta - \nabla$ c) $\frac{\Delta}{\nabla} = \Delta + \nabla$ d) $\nabla = 1 - E^{-1}$	1	CO2
	(vi)	One root of the equation $x^2 + \cos x + 2 = 0$ lies between a) 1 and 2 b) 0 and 0.5 c) 0.5 and 1 d) none of these.	1	CO3

(vii)	The two regression lines involving the two variables x and y are $x + 4y + 3 = 0$ and $4x + 9y + 5 = 0$. The mean of x and y are a) 0,1 b) 1,-1 c) 1,2 d) -1,1	1	CO3
(viii)	Standard deviation is independent of change of a) Origin b) Scale c) both (a) and (b) d) none of these	1	CO2
(ix)	The total error committed in composite Simpson's 1/3 rd. rule is given by a) $-\frac{1}{90}h^5\frac{n}{2}f^{iv}(\zeta)$ b) $-\frac{1}{2}h^3 n f''(\zeta)$ c) $-\frac{1}{90}h^5 f^{iv}(\zeta)$ d) $-\frac{b-a}{180}h^4\frac{n}{2}f^{iv}(\zeta)$	1	CO2
(x)	Euler method for ODE has a truncation error of the order of a) h^3 b) h^2 c) h^4 d) h^1	1	CO1
(xi)	The A.M and G.M of two numbers are respectively 5 and 4. The value of H.M. is a) 3 b) 3.2 c) 3.4 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.		Use Newton Raphson method to find $\sqrt{27}$, correct to four significant figures.	5	CO3
3.		Find the missing terms from the following table	5	CO3

x	0	5	10	15	20	25
y	6	10	--	17	--	31

4.		Find the relative percentage error in the computation of $x-y$ for $x=12.05$ and $y=8.02$ having absolute error $\Delta x=0.005, \Delta y=0.001$.	5	CO3
5.		Find the equation of the line of regression of y on x for the following data:	5	CO3

x:	1	2	3	4	5
y:	5	7	6	8	11

6.		Compute one positive root of $3x-\cos x-1=0$, correct to two decimal places by using method of bisection.	5	CO3

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

			Marks	CO No.
7.	(a)	Compute $y(0.2)$ by Runge-Kutta method of fourth order for the differential equation $\frac{dy}{dx}=1+xy,\ y(0)=1.$ taking step length h=0.1	8	CO3
	(b)	Solve the system of equations by Gauss Elimination method: $x+y+8z=10$ $5x+2y-z=6$ $3x+5y+z=9$	7	CO3
8.	(a)	Evaluate $\int_0^1 \frac{x}{1+x^2}dx$ by Trapezoidal rule and Simpson's 1/3 rule, taking 6 equal subintervals up to three decimal places.	7	CO3
	(b)	Find $f(1.02)$ using Newton's forward interpolation from the table	8	CO3

x:	1.00	1.50	2.00	2.50
f(x):	0.841	0.891	0.932	0.963

9. (a) Use Lagrange interpolation formula to compute f(4) from — 7 — CO3

x	0	1	2	3	5
y=f(x)	6	8	9	11	15

(b) Write geometrical interpretation of Newton Raphson method. — 5 — CO4

(c) Compute y(1.2) for the following differential equation — 3 — CO3

$\frac{dy}{dx} = x^2 y$, y=1 when x=1, taking step length h=0.1, using Euler's method, correct up to three decimal places.

10. (a) Do these two lines $x+2y=5$ and $2x+3y=8$ as the regression lines? Give reasons. — 4 — CO4

(b) Calculate median and mode from the following frequency distribution table. — 7 — CO3

Class	Frequency
65 - 84	9
85 - 104	10
105 - 124	17
125 - 144	18
145 - 164	5
165 - 184	4
185 - 204	3

(c) Find Mean, Variance and Standard Deviation from the following table — 4 — CO3

$$\begin{bmatrix} Data: & 1 & 2 & 3 & ..... & n \\ Frequency: & 1 & 2 & 3 & ..... & n \end{bmatrix}$$

11. (a) If T is an unbiased estimator of θ, show that $\sqrt{T}$ is biased estimate of $\sqrt{\theta}$. — 4 — CO3

(b) Given that the variance of x is 9. The regression equations are $8x - 10y + 66 = 0$ *and* $40x - 18y = 214$. Find — 6 — CO3
(i) Mean values of x and y.
(ii) Correlation coefficient between the two variables.
(iii) Standard deviation of y.

(c) The monthly income of 175 workers in a factory were recorded. This give sample mean as Rs. 3440.65 and the S.d. as Rs. 125.32. Find 95% confidence interval of the average monthly income. — 5 — CO3
[Given $\int_{1.96}^{\infty} \varphi(x)dx = 0.025$]