NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

B.TECH/IT/ODD/SEM-3/M(IT)302/2020-2021
PAPER TYPE: REGULAR/SUPPLE(R18)
YEAR: 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)

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

SL. NO.	Question	Marks	CO No.
(i)	Simpson's 1/3rd rule is used when a) N is odd b) N is even c) N is multiple of three d) None of these	1	2
(ii)	The percentage error in approximated 4/3 to 1.3333 is a) 0.0025% b) 25% c) 0.000025% d) d) 0.25%	1	2
(iii)	Runge-Kutta formula has a truncation error, which is of the order of a) h^2 b) h^4 c) h^5 d) h^3	1	1
(iv)	One root of the equation $x^2 + 2x + 2 = 0$ lies between a) 1 and 2 b) 0 and 0.5 c) 0.5 and 1 d) none of these	1	3
(v)	Product of regression coefficients is a) 1 b) -1 c) 0.5 **d)** ρ^2	1	3
(vi)	Error in Trapizoidal's rule is given by a) $-\frac{nh^3}{12} f''(\xi)$ b) $-\frac{n^2h^3}{12} f''(\xi)$ c) $-\frac{nh^3}{6} f''(\xi)$ d) None	1	3

(vii) Interpolation is helpful for estimating
a) Missing values of a series
b) An intermediate value for a given argument — 1 — 3
c) The argument for a given entry
d) All of these

(viii) Newton-Raphson method is also known as_____ method — 1 — 4
a) normal
b) tangent
c) parallel
d) None

(ix) Modified Euler method is used to solve — 1 — 4
a) 1^{st} Order ODE
b) 1^{st} Order PDE
c) 1^{st} Order Linear Equation
d)None

(x) Newton's Divided Difference interpolation formula is used for — 1 — 4
a) Equispaced arguments only
b) unequispaced arguments only
c) Both equispaced and unequispaced argumentsd
d) none of these

(xi) Correlation Coefficient lies in — 1 — 1
a) [-1,1]
b) [0,1]
c) [0,2]
d) None of these

(xii) Which of the following belongs to statistics — 1 — 4
a) Sampling method
b) Descriptive statistics
c) Inferential statistics
d) All of the above

GROUP – B
(Short Answer Type Questions)

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

2. Find the missing term in the following table: — 5 — 2

x	0	5	10	15	20	25
f(x)	6	10	-	17	-	31

3. Find the equation of the line of regression of x on y for the following data: — 5 — 1

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	5.3	5.7	6.3	7.2	8.2	8.7	8.4

4. Use Newton Raphson method to compute $\sqrt[4]{23}$, correct to 3 decimal places. — 5 — 3

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 — 3

6. Find correlation coefficient from the following table 5 3

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

GROUP – C
(Long Answer Type Questions)

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

7. (a) Solve the following systems of equation using LU Factorization method 8 3

$$2x + 2y + 4z = 18$$
$$x + 3y + 2z = 13$$
$$3x + y + 3z = 14$$

(b) Find the value of $f(2.0)$ correct up to 2 decimal places from the following table (using Newton's Forward Interpolation Formula): 7 3

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

8. (a) Use Modified Euler's method to find y (1.2) correct to 4 decimal places. 9 4

Given that $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}, \quad y(1) = 1$

(b) Establish the Relationship between forward difference interpolation and backward difference interpolation operator & Shift Operator 6 1

9. (a) Compute root of algebraic equation: 8 3

$f(x)=x^2+x-5=0$ by method of iteration. Correct up to three significant figures

(b) Using approximate formula find f(0.21) & f(0.29) from the following table 7 3

X	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

10. (a) Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$ 7 2

(b) Fit a straight line to the following data 8 3

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 3

(b) Prove that the sample mean is unbiased estimator of the population mean. 7 3