Student University Roll No.:	Enrolled Year:

School of Engineering
Second Sessional Examination, Even Semester (A.S. 2023-24)
B. Tech: All Branch [Year: Second] [Semester: IV]

Course Title: Statistical and Numerical Technique Course Code: BAS3401	Max Marks: 60 Time: 3*hrs*

Instructions if any: Read the question Carefully.

	SECTION 'A'	CO	Marks
Q.N.1. Attempt all parts of the following:			
a)	Define rank correlation coefficient.	1	1
b)	Write the formula of t-test.	4	1
c)	If one of the regression coefficients is 0.8 and coefficient of correlation is 0.6, what would be the value of another regression coefficient?	1	1
d)	What is the order of convergence of bisection method?	6	1
e)	Define relative error with example.	5	1
f)	Prove that $\nabla = 1 - E^{-1}$.	7	1
g)	Write the formula of Simpson's $3/8^{th}$ rule.	12	1
h)	Write the formula of Runge-Kutta method of fourth order.	8	1
	SECTION 'B'	CO	Marks
Q.N.2. Attempt any two parts of the following:			
a)	Calculate Karl Pearson's coefficient of correlation for the data given below x: 10, 14, 18, 22, 26, 30 y: 18, 12, 24, 6, 30, 36	1	6
b)	In a sample of 1000 cases, the mean of a certain test is 14 and S.D. is 2.5. Assuming the distribution to be normal, find (i) How many score above 18? (ii) How many score below 8? where z(1.6) = 0.4452 and z(2.4) = 0.4918	3	6
c)	Find a real root of $x^3 + x - 1 = 0$ by using Regula-falsi method, correct upto four decimal places.	6	6
d)	Apply Gauss-Jordan method to solve the following equations: $x + y + z = 9$ $2x - 3y + 4z = 13$ $3x + 4y + 5z = 40$	10	6
	SECTION 'C'	CO	Marks
Q.N.3. Attempt any two parts of the following:			
a)	Two lines of regression are given by $5y - 8x + 17 = 0$ & $2y - 5x + 14 = 0$. If $\sigma_y^2 = 16$, Find (i) the mean value of x and y (ii) σ_x^2 (iii) the coefficient of correlation between x and y.	1	6
b)	The data given below are the number of defectives in 10 samples of 100 items each, construct an np-chart and comment on the results: Sample No: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 No. of defectives: 6, 16, 7, 3, 8, 12, 7, 11, 11, 4	2	6

c)

Economic condition	High	Low	Total
Rich	100	300	400
Poor	350	250	600
Total	450	550	1000

Find out whether there is any association between economic condition at home and I.Q. of the students. Given for 1 degree of freedom, chi-square at the level of significance 0.05 is 3.84 | 4 | 5

Q.N.4. Attempt any two parts of the following:

a) Find the real root of the equation $x^4 - x - 9 = 0$ by Newton-Raphson method, correct to three places of decimal. | 6 | 5

b) Solve the following system:

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22$$

by Gauss- Seidel method correct to two places of decimal. | 10 | 5

c) Solve by Jacobi's method:

$$4x + y - 3z = 17$$
$$x + 5y + z = 14$$
$$2x - y + 8z = 12$$ | 10 | 5

Q.N.5. Attempt any two parts of the following:

a) Find the missing value in the table:

x	0	1	2	3	4
y	1	3	-----	31	81

| 7 | 5

b) Evaluate $\int_0^1 \frac{dx}{1+x}$ by dividing the interval of integration into 8 equal parts, using Simpson's $1/3^{rd}$ rule. Hence find $\log_e 2$ approximately. | 12 | 5

c) Using Euler's method, find an approximate value of y corresponding to $x = 2$ given that $\frac{dy}{dx} - x - 2y = 0; \quad y(1) = 1.$ | 8 | 5

Q.N.6. Attempt any two parts of the following:

a) Using Lagrange's interpolation formula find the value of y(10) from the following table:

X	5	6	9	11
Y	12	13	14	16

| 7 | 5

b) From the following table, find the first derivative at $x = 4$.

x	1	2	4	8	10
f(x)	0	1	5	21	27

| 9 | 5

c) Find the value of y(0.2) using Runge-Kutta method of fourth order given that $5\frac{dy}{dx} = x^2 + y^2, y(0) = 1$, take $h = 0.1$ | 8 | 5

X

Table 1: Mapping between COs and Questions
(Number of COs may vary from course to course)

COs	Questions Numbers	Total Marks
CO1	1a, 1c, 2a, 3a	13
CO2	3b	5
CO3	2b	6
CO4	1b, 3c	6
CO5	1e	1
CO6	1d, 2c, 4a	12
CO7	1f, 5a, 6a	11
CO8	1h, 5c, 6c	11
CO9	6b	5
CO10	2d, 4b, 4c	16
CO12	1g, 5b	6