Reg. No.												

Question Paper Code	12011

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL/MAY 2023
Fourth Semester
Civil Engineering

17 JUL 2023

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Mechanical Engineering & Mechanical and Automation Engineering)

20BSMA403 – STATISTICS AND NUMERICAL METHODS
(Regulations 2020)

(Use of Statistical table is permitted)

Duration: 3 Hours
Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

Marks, K-Level, CO

1.	Define Type-I and Type-II error.	2,K1,CO1
2.	State the uses of chi-square test.	2,K1,CO1
3.	Why a 2 x 2 Latin square is not possible? Explain.	2,K2,CO2
4.	Write any two differences between RBD and LSD.	2,K1,CO2
5.	By Gauss elimination method solve $x + y = 7, 2x + 3y = 10$.	2,K2,CO3
6.	What is the order and condition for convergence of Newton-Raphson method?	2,K1,CO3
7.	Write down the expression for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = x_0$ by Newton's forward difference formula.	2,K2,CO4
8.	Construct the divided difference table for following the data.	2,K2,CO4

x	0	1	3
$f(x)$	5	6	14

9.	Using modified Euler's method find y at $x = 0.1$, if $\frac{dy}{dx} = 1 + y$, $y(0) = 2$.	2,K2,CO5
10.	State Taylor's series algorithm for the first order differential equation.	2,K1,CO5

PART - B (5 × 16 = 80 Marks)
Answer ALL Questions

11.	a	(i) The theory predicts that the proportion of beans in the four groups A, B, C and D should be $9:3:3:1$. In an experiment among 1600 beans, the numbers in the four groups were 882,313,287 and 118. Do the experimental results support the theory?	8,K3,CO1

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

12011

(ii) A simple sample of heights of 6400 Englishmen has a mean of 170cm and a SD of 6.4cm, while a simple sample of heights of 1600 Americans has a mean of 172cm and a SD of 6.3cm. Do the data indicate that Americans are, on the average, taller than Englishmen? *8,K3,CO1*

OR

b (i) Before an increase in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increase in duty, 800 people were tea drinkers in a sample of 1200 people. State whether there is a significant decrease in the consumption of tea after the increase in exercise duty. *8,K3,CO1*

(ii) The heights of 10 students of a school are found to be 70,67,62,68,61,68,70,64,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches? *8,K3,CO1*

12. a A company appoints 4 salesmen (A, B, C and D) and observe their sales in 3 seasons as shown under. Carry out analysis of Variance using two-way classification. *16,K3,CO2*

	Salesman			
	A	B	C	D
Summer	45	40	38	37
Winter	43	41	45	38
Monsoon	39	39	41	41

OR

b In a Latin Square experiment given below are the yields in quintals per acre on the paddy crop carried out for testing the effect of five fertilizers A, B, C, D, E. Analyze the data for variations. *16,K3,CO2*

B	25	A	18	E	27	D	30	C	27
A	19	D	31	C	29	E	26	B	23
C	28	B	22	D	33	A	18	E	27
E	28	C	26	A	20	B	25	D	33
D	32	E	25	B	23	C	28	A	20

13. a (i) Solve the equations $10x+y+z=12$, $2x+10y+z=13$, and $x+y+5z=7$ by Gauss Jordan method. *8,K3,CO3*

(ii) Determine the numerically largest Eigen value and the corresponding Eigen vector of the following matrix, using the power method $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$. *8,K3,CO3*

OR

b   (i) Find the real root of the equation $3x = cosx + 1$ using Newton-Raphson method.

(ii) Solve the following system of equations by Gauss seidel method
$10x - 5y - 2z = 3, 4x - 10y + 3z = -3, x + 6y + 10z = -3$.

14. a)   (i) Use Lagrange's interpolation formula to find $f(10)$ from the following data:

x	5	6	9	11
$f(x)$	12	13	14	16

(ii) Evaluate $\int_{1}^{1.2}\int_{1}^{1.4} \frac{1}{1+x} dx\, dy$ by Trapezoidal rule with $h = k = 0.1$.

OR

b)   (i) Using the following data, find $f'(5), f''(5)$ by Newton's forward method.

$x:$	10	15	20	25	30	35
$f(x)$	35	33	29	27	22	14

(ii) Evaluate $\int_{1}^{5}\int_{1}^{4} \frac{1}{x+y} dxdy$ Simpson's one third rule with $h = k = 1$.

15. a)   (i) Apply Runge-Kutta method to find approximate value of y for $x = 0.1$ if $\frac{dy}{dx} = x + y^2$ given that $y = 1$ when $x = 0$.

(ii) Using Crank-Nicholson method, solve $u_{xx} = 16u_t$, $0 < x < 1$, $t > 0$, $u(x,0) = 0$, $u(0, t) = 0, u(1,t) = 100t$. Compute u for one step with $h = \frac{1}{4}$.

OR

b)   Given $\frac{dy}{dx} = x^2(1+y)$, $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.970$, evaluate $y(1.4)$ evaluate y(1.4) by Adam's Bash-forth method.