Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Second Semester

Agricultural Engineering

MA3251/UMAT24201 - Statistics and Numerical Methods

(Common to all branches)

Statistical table values are permitted

Regulations - 2021/2024

Duration : 3 Hrs ***Maximum: 100 Marks***

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Define Type-1 and Type-II errors.	L1	1	2
2.	Explain the level of significance in testing the hypothesis.	L1	1	2
3.	Explain the basic principles of design of experiments.	L1	2	2
4.	Compare randomized block design and Latin square design.	L2	2	2
5.	Write the order of convergence and criteria of convergence of Newton Raphson method.	L1	3	2
6.	Compare Gauss Elimination and Gauss Jordan method.	L2	3	2
7.	State the Lagrange's interpolation formula.	L1	4	2
8.	State the numerical single integration formula using trapezoidal and Simpson's $1/3$ rule.	L1	4	2
9.	Write the formula for modified Euler's method.	L1	5	2
10.	Write Adam's - Bash forth predictor corrector formula.	L1	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a i	A certain injection administered to each of 12 patients resulted in the following increase of blood pressure: $5, 2, 8, -1, 3, 0, 6, -2, 1\ 5, 0, 4.$ Can it be concluded that the injection will be, in general, accompanied by an increase in blood pressure?	L4	1	8
	ii	Test the significance of the difference between the means of the samples, drawn from two normal populations with the same standard deviation from the following data:	L4	1	8

Sample 1	Size	Mean	Standard Deviation
	100	61	4
Sample 2	200	63	6

Or

b i Test the two random samples have been drawn from the same normal population for the following data's: L4 1 8

	Size	Mean	Variance
Sample I:	8	9.6	1.2
Sample II:	11	16.5	2.5

ii Fit a Poisson distribution for the following distribution and also test the goodness of fit: L4 1 8

x:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400

12. a Analyze the variance in the following two way analysis using 5% level of significance to study the performance of three detergents and three different water temperature were obtained with designed equipment. L4 2 16

Water temperature	Detergent A	Detergent B	Detergent C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

Or

b Analyze the variance in the following Latin square of yields (in kg's) of paddy, where A, B, C, D denote the different methods of cultivation. L4 2 16

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

Examine whether the different methods of cultivation have given significantly different yields.

13. a i Apply Newton's method to find the real root of the equation $x^3 - 6x + 4 = 0$ correct to four decimal places. L4 3 8

ii Solve by Gauss-Seidal iteration method, the following system of equations $20x + y - 2z = 17,\ 3x + 20y - z = -18,\ 2x - 3y + 20z = 25$. L4 3 8

Or

b	i	Solve the system of equations by Gauss Elimination method $x + 2y + z = 3, \quad 2x + 3y + 3z = 10, \quad 3x - y + 2z = 13.$	L4	3	8
	ii	Apply power method to find the largest eigenvalue and corresponding eigenvector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$. Take $[1,\ 0,\ 0]^T$ as the initial eigenvector.	L4	3	8
14.	a	i Make use of Lagrange's interpolation to calculate the profit in the year 2000 from the following data:	L4	4	8

Year:	1997	1999	2001	2002
Profit in Lakhs of Rs:	43	65	159	248

	ii	Make use of Newton's divided difference formula to find $f(8)$ and $f(15)$ from the following data:	L4	4	8	

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

Or

b	i	Apply Newton's forward and backward difference interpolation to find the values of y at $x = 21$and $x = 28$ from the following data:	L4	4	8	

x:	20	23	26	29
y:	0.3420	0.3907	0.4384	0.4848

	ii	Apply trapezoidal rule to evaluate $I = \int_1^2 \int_1^2 \frac{dxdy}{xy}$.	L4	4	8	
15.	a	i Apply Taylor's series method to find the values of *y* at *x* =0.1 and *x* =0.2 to five places of decimals from $\frac{dy}{dx} = x + y,\ y(0) = 1.$	L4	5	8	
		ii Solve the following by Euler's modified method $\frac{dy}{dx} = \log(x + y),\ y(0) = 2$ at $x = 1.2$ and 1.4 with $h = 0.2$.	L4	5	8	

Or

b	i	Apply Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$.	L4	5	8
	ii	Make use of Milne's method to find *y* (4.5) given $5xy' + y^2 - 2 = 0$ $given \quad y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097,$ $y(4.3) = 0.0143;\ y(4.4) = 1.0187.$	L4	5	8