Reg. No: | | | | | | | | | | | | |

Question Paper Code:U4M25

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fourth Semester

Agricultural Engineering

21UMA425 - PROBABILITY, STATISTICS AND NUMERICAL METHODS

(Regulations 2021)

(Statistical Tables are permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Probability of an impossible event is CO6- U

   (a) 1 (b)10 (c)0 (d) 100

2. The mean of the random variable is denoted by CO6- U

   (a) E(X) (b) $E(X^2)$ (c) 0 (d) 1

3. The degrees of freedom in t-tests is CO6- U

   (a) n-1 (b) n-2 (c) n-3 (d) n-4

4. Large sample size is CO6- U

   (a) 30 (b) >30 (c) <30 (d) none of these

5. Latin square design is a _____ CO6- U

   (a) One way (b) Two way (c) Three way (d) None of these

6. The stimulus to the development of theory and practice of experimental design came from CO6- U

   (a) Agricultural research (b) Bio medical research

   (c) Chemical research (d) None of these

7. The n^{th} divided difference of n^{th} degree polynomial is CO6- U

   (a) constant (b) variable (c) equal (d) unequal

8. In Newton's forward formula, u =. CO6- U

(a) $\frac{x-x_0}{h}$ (b) $\frac{x-x_1}{h}$ (c) $\frac{x-x_2}{h}$ (d) $\frac{x-x_n}{h}$

9. Trapezoidal rule is so called, because it approximates the integral by the sum of _____trapezoids CO6- U

(a) n (b) n+1 (c) n-1 (d) 2n

10. Gaussian three point quadrature formula is exact for polynomials up to degree _____ CO6- U

(a) 1 (b) 2 (c) 3 (d) 5

PART – B (5 x 2= 10 Marks)

11. Find the mean for the discrete RV X with probability distribution CO1- App

X	-2	-1	0	1
P(X)	0.4	0.1	0.2	0.3

12. Define Chi-square test of goodness of fit. CO6- U

13. For a one way classification on 16 observations involving 5 treatments the sum of squares of treatment and sum of squares of total are 132 and 253 respectively, compute the value of the F – ratio . CO6- U

14. When will we apply Newtons forward interpolation formula? CO6- U

15. Write down Romberg's formula for I_1 and I_2 as well as I_2 and I_3 CO6 -U

PART – C (5 x 16= 80 Marks)

16. (a) A Random Variable X has the following probability distribution CO1- App (16)

X=x	0	1	2	3	4	5	6	7
P(X=x)	0	a	2a	2a	3a	a^2	$2a^2$	$7a^2+a$

Find (i) 'a'

(ii) P(X < 6), P(X≥6), P(0 < X < 4),

(iii) P(X < 6/ X > 4)

(iv) Find the minimum value of 'λ'such that $P(X \leq \lambda) > \frac{1}{2}$

Or

(b) (i) Define Gamma distribution. Find the moment generating function and Hence find mean and variance. CO1- App (8)

(ii) In a large consignment of electric bulbs 10 % are defective. A random sample 20 bulbs are taken for inspection. Find the probability that (i) all are good bulbs (ii) exactly three defective bulbs CO1 -App (8)

17. (a) (i) Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables. CO2- Ana (8)

Sample I	18	13	12	15	12	14	16	14	15
Sample II	16	19	13	16	18	13	15		

Do the estimates of the population variance differ significally at 5% level?

(ii) Two group of students A and B were tested , the marks obtained were as follows CO2- Ana (8)

A	18	20	36	50	49	36	34	49	41
B	29	28	26	35	30	44	46		

Examine the significance of difference between the average marks secured by the students of the above two groups

Or

(b) (i) The following data are collected on two characters. CO2- Ana (8)

	Smokers	Non Smokers
Literates	83	57
Illiterates	45	68

Using chi-square test to find is there any relation between smoking and literacy

(ii) A random sample of 16 values from a normal population showed a mean of 41.5 inches and the sum of squares of deviations from this mean equal to 135 square inches. Show that the assumption of a mean of 43.5 inches for the population is not reasonable. Obtain 95 percent and 99 percent fiducial limits for the same. CO2- Ana (8)

18. (a) Four varieties A, B, C, D of a fertilizer are tested in a randomized block design with 4 replication. The plot yields in pounds are as follows. CO3- Ana (16)

	1	2	3	4
1	A(12)	D(20)	C(16)	B(10)
2	D(18)	A(14)	B(11)	C(14)
3	B(12)	C(15)	D(19)	A(13)
4	C(16)	B(11)	A(15)	D(20)

Analyse the experimental yield.

Or

(b) Analyze the variance in the latin square of yields(in kgs) paddy where P,Q,R,S denote the different methods of cultivation. CO3- Ana (16)

S122	P121	R123	Q122
Q124	R123	P122	S125
P120	Q119	S120	R121
R122	S123	Q121	P122

19. (a) Fit a natural cubic spline for the following data CO4- App (16)

X	-1	0	1	2
Y	-1	1	3	35

Or

(b) (i) Using Newton's backward, find f (5.5). CO4- App (8)

X	1	2	3	4	5	6
Y	0	1	8	27	64	125

(ii) Using Lagrange's interpolation formula find f(4) given that f(0) = 2; f(1) = 3; f(2) = 12; f(15) = 3587 CO4- App (8)

20. (a) Evaluate $\int_0^1 \int_0^1 e^{-(x+y)} dxdy$ by (i). Trapezoidal (ii) Simpson's rule by taking h=k=0.5 CO5- App (16)

Or

(b) (i) Evaluate CO5- App (8)

$\int_0^2 \frac{dx}{x^2+4}$ using Romberg method by taking h=1, 0.5 and 0.25 successively

(ii) Evaluate. CO5- App (8)

$\int_1^5 \frac{dx}{x}$ Using three point Gaussian quadrature formula.