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**Question Paper Code:U4M25**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 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)

- The limiting form a Poisson distribution is CO6- U  
(a) Geometric            (b) Binomial            (c) Normal            (d) None of the above
- Probability of an impossible event is CO6- U  
(a) 1            (b) 10            (c) 0            (d) 100
- The degrees of freedom in t-tests is CO6- U  
(a) n-1            (b) n-2            (c) n-3            (d) n-4
- Large sample size is CO6- U  
(a) 30            (b) >30            (c) <30            (d) none of these
- Latin square design is a \_\_\_\_\_ CO6- U  
(a) One way            (b) Two way            (c) Three way            (d) None of these
- 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
- The  $n^{\text{th}}$  divided difference of  $n^{\text{th}}$  degree polynomial is CO6- U  
(a) constant            (b) variable            (c) equal            (d) unequal

8. In Newton's backward formula,  $v =$ . 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. The Simpson's one third rule is approximated by \_\_\_\_\_ CO6- U
- (a) parabola                      (b) trapezoidal                      (c) hyperbola                      (d) elliptic

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. Define Normal distribution. CO6- U
12. Write the important properties of Chi-square-distribution CO6- U
13. Write down the ANOVA table for CRD. 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 <sup>2</sup>	2a <sup>2</sup>	7a <sup>2</sup> +a

- Find (i) 'a'
- (ii)  $P(X < 6)$ ,  $P(X \geq 6)$ ,  $P(0 < X < 4)$ ,
- (iii)  $P(X < 6 / X > 4)$
- (iv) Find the minimum value of ' $\lambda$ ' such that  $P(X \leq \lambda) > \frac{1}{2}$

Or

- (b) (i) Using the probability mass function for Binomial distribution, CO1- App (8)  
 Compute the moment generating function and hence find its mean and variance.
- (ii) Using an Exponential distribution State and Prove the memory less property 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 significantly 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 theory predicts the population 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. Does the experimental result support the theory? CO2- Ana (8)

- (ii) Two random samples gave the following results: CO2- Ana (8)

Samples	Size	Sample Mean	Sum of the squares of deviation from the mean
1	10	15	90
2	12	14	108

Examine whether the samples come from the same normal population

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) Find  $f(3)$  by Newton's divided difference formula for the data CO4- App (8)

X	-4	-1	0	2	5
Y	1245	33	5	9	1335

- (ii) Using Newton's backward interpolation formula find  $f(4)$  CO4- App (8)

x	0	1	2	3
y	1	2	3	10

20. (a) Evaluate  $\int_0^1 \int_0^1 \frac{dxdy}{1+x+y}$  by (i). Trapezoidal (ii) Simpson's rule by taking  $h=k=0.25$  CO5- App (16)

Or

- (b) (i) Evaluate  $\int_0^2 \frac{dx}{x^2+4}$  using Romberg method by taking  $h=1, 0.5$  and  $0.25$  successively. CO5- App (8)

- (ii) Evaluate.  $\int_1^5 \frac{dx}{x}$  Using three point Gaussian quadrature formula. CO5- App (8)