A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 54025

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Agriculture Engineering

15UMA425 - PROBABILITY,STATISTICS AND NUMERICAL METHODS

(Regulation 2015)

(Statistical tables maybe permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. If X is a continuous random variable. Relate E(X)= CO1- R

   (a) $\int_{-\infty}^{\infty} xf(x)dx$ (b) $\int_{-\infty}^{\infty} f(y)dy$ (c) $\int_{-\infty}^{\infty} f(x,y)dx$ (d) $\int_{-\infty}^{\infty} f(x,y)dy$

2. If the random variable X has uniform distribution in (-3,3) , then its mean is CO1- App

   (a) 2 (b) 1.96 (c) 3 (d) 0

3. When the population parameter is less than a certain value, the test is called CO2-R

   (a) left – tailed test (b) right tailed test (c) two tailed test (d) none of these

4. Choose the correction factor_____ CO2- App

   (a) T^2N (b) T/N (c) T^2/N (d) 0

5. The number of factors analysed in Completely Randomised Block Design is CO3- R

   (a) Two (b) One (c) Three (d) Four

6. The number replications of each treatment and the number of treatments in LSD is CO3- R

   (a) Equal (b) Unequal (c) Equal to two (d) Equal to one

7. In Cubic Spline, $M_0=M_n=$ _____ CO4-R

   (a) 1 (b) n (c)0 (d) 3

8. The value of any divided difference is _____ of the order of the arguments. CO4- R

(a) equal (b)dependent (c) unequal (d) independent

9. Degree of y(x) in Simpson's one third rule is_____ CO5- R

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

10. The condition for the point x_0 to be a maximum value is _____ CO5- R

(a) $f''(x) < 0$ (b) $f'(x_0) < 0$ (c) $f''(x_0) < 0$ (d) $f'(x) < 0$

PART – B (5 x 2= 10Marks)

11. If X is a continuous random variable, find the value of k if f(x)=2x, 0<x<3. CO1- R

12. Define the expected frequency in tests for independence of attributes. CO2- R

13. Why a 2x2 Latin square is not possible? Explain. CO3- U

14. State Newton's divided difference formula CO4- App

15. State Simpson's 1/3rd rule. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) A RV X has the following distribution CO1- App (8)

x	0	1	2	3	4	5	6	7
P(X)	0	a	2a	2a	3a	3a	4a	5a

(i) Find the value of 'a'

(ii) Find $P(X < 5)$, $P[2 < X < 5]$

(ii) Derive MGF, mean and variance of exponential distribution. CO1- App (8)

Or

(b) (i) The pdf of CO1- App (8)

$$f(x,y) = \begin{cases} ax & ,0 \le x \le 1 \\ a & ,1 \le x \le 2 \\ 3a - ax & ,2 \le x \le 3 \\ 0 & ,Otherwise \end{cases}$$ then find 'a' and cumulative distribution function of X.

(ii) The time (in hours) required to repair a machine is exponentially distributed with parameter $\lambda = 1/2$. CO1- App (8)

(1) What is the probability that the repair time exceeds 2 hours?

(2) What is the conditional probability that a repair takes at least 10 hours given that its duration exceeds 9 hours?

17. (a) (i) The means of two simple large samples of 1000 and 2000 members are 67.5 inches and 68 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation of 2.5 inches? Test at 5% level of significance. CO2- App (8)

(ii) The mean height and the standard deviation height of eight randomly chosen soldiers are 166.9 cm. and 8.29 cm. respectively. The corresponding values of six randomly chosen sailors are 170.3cm and 8.50cm. respectively. Based on this data, can we conclude that soldiers are, in general, shorter than sailors at 5% level of significance? CO2- App (8)

Or

(b) (i) The following table gives the number of air-craft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week at 5% level of significance. CO2- Ana (8)

Day	Mon	Tues	Wed	Thu	Fri	Sat
No. of accidents	15	19	13	12	16	15

(ii) A sample of size 13 gave an estimated population variance of 3.0, while another sample of size 15 gave an estimate of 2.5. Could both samples be from populations with the same variance at 5% level of significance? CO2- Ana (8)

18. (a) The following table shows the lives in hours of four batches of electric lamps CO3- Ana (16)

Batches	Lives in hours							
1	1610	1610	1650	1680	1700	1720	1800	
2	1580	1640	1640	1700	1750			
3	1460	1550	1600	1620	1640	1660	1740	1820
4	1510	1520	1530	1570	1600	1680		

Perform an analysis of variance on these data and show that a significant test does not reject their homogeneity.

Or

(b) Analyze the data given below and interpret the results. CO3- Ana (16)
Table Value F(4,12)=3.26, F(12,4)=5.91

A(13)	B(09)	C(21)	D(07)	E(06)
D(09)	E(08)	A(15)	B(07)	C(16)
B(11)	C(17)	D(08)	E(10)	A(17)
E(08)	A(15)	B(07)	C(10)	D(07)
C(11)	D(09)	E(08)	A(11)	B(15)

19. (a) (i) Find f(3) by Newton's divided difference formula for the data CO4- App (8)

X	-4	-1	0	2	5
Y	12	33	5	9	35

(ii) The following data are taken from the steam table: CO4- App (8)

$Temp^0 c$	140	150	160	170	180
Pressure	3.685	4.854	6.502	8.076	10.225

Find the pressure at t=142°

Or

(b) (i) From the following table find f(x) and hence find f(6) using Newton's divided difference formula. CO4- App (8)

x : 1 2 7 8

$f(x)$: 1 5 6 4

(ii) Using cubic spline, find y(0.5) and y'(1) given $M_0 = M_2 = 0$ and the table CO4- App (8)

X	0	1	2
Y	-5	-4	3

20. (a) (i) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Trapezoidal rule. CO5-App (8)

(ii) Evaluate $\int_0^{\pi} \sin x dx$ by Simpson's $\frac{1}{3}^{rd}$ rule. CO5- E (8)

Or

(b) (i) Evaluate $\int_{0.2}^{1.5} e^{-x^2} dx$ using the three point Gaussian Quadrature CO5- E (8)

k = 0.1.

(ii) Apply Gauss three point formula to evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$. CO5- E (8)