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

Fourth Semester

Agriculture Engineering

19UMA425 - Probability, Statistics and Numerical Methods

(Regulation 2019)

Duration: Three hours   Maximum: 100 Marks

PART A   10*2 =20 Marks

Answer any ten of the following questions

1. Using the probability mass function, compute the constant k   CO1- App

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2k	0.3	3k

2. A continuous random variable has the probability density function is given by f(x)   CO1- App
    $= Kx (1 - x), 0 < x < 1$, calculate the value of the constant K.

3.   A random variable X follows an exponential distribution with parameter $\lambda = 1/5$ CO6- U
    then find the mean   value .

4. Write the degrees of freedom for the sample size n= 20.   CO6- U

5. If $S_1^2 = 13.333$ and $S_2^2 = 28.545$ then calculate the value ofF- ratio.   CO2-App

6. If A,B are two independent attributes and if (A) = 36, (B) = 25 and N = 100 then   CO6- U
    find (AB).

7. Write the degrees of freedom for the variation due to error term in an 3×3Latin   CO6- U
    square design.

8.   For a one way classification on 12 observations involving 3 treatments the sum of CO3- App
    squares of treatment and sum of squares of total are 8 and 36 respectively,
    calculate the value of the F – ratio.

9   Write the degrees of freedom for the variation due to error term in one way   CO6- U
    classification.

10   Calculate the second divided difference for the following data.   CO4- App

x	5	15	22
y	7	36	160

11 If f(0) = 14, f(5) = 379, f(10) =1444 and f(15)= 3584 then compute the third   CO4- App
    difference.

12 In Cubic Spline, what is the value of M_0 & M_n ?   CO6- R

13 Why is Trapezoidal rule is so called?   CO6- R

14 Write the error in Simpson's rule and its order.   CO6- U

15   CO5- App
    Using Simpson's 1/3 rule calculate $\int_0^4 e^x \, dx$ given $e^0 = 1, e^1 = 2.72, \quad e^2 = 7.39$

    $e^3 = 20.09$ and $e^4 = 54.6$

<div align="center">PART B   5*16 = 80 Marks</div>

<div align="center">(Answer any FIVE of the Following Questions)</div>

1. If the probability density function of a continuous random variable X is
    given by   CO1 App   (16)

    $$f(x) = \begin{cases} ax & ; \ 0 \le x \le 1 \\ a & ; \ 1 \le x \le 2 \\ 3a - ax & ; \ 2 \le x \le 3 \\ 0 & otherwise \end{cases}$$

    Calculate (i) the value of "a" (ii) the distribution function of X   .

2. A group of 10 rats fed on diet A and another group of 8 rats fed on diet B,   CO2- Ana   (16)
    recorded the following increase in weight.

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	10	1	2	8		

    Analyze the given data find the variances are significantly different.

    Table value is F(9,7) = 3.68

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

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

Table value is F(3,6) = 4.76

4. Using Newton's interpolation formula determine the polynomial function f(x) and f(x)at x = 5 & 9

   CO4- App   (16)

x	4	6	8	10
y	1	3	8	10

5. Evaluate $\int\limits_{1}^{1.4} \int\limits_{2}^{2.4} \frac{1}{xy} dxdy$ by using Trapezoidal & Simpson's Rule with

   CO5- App   (16)

   h = 0. 1 & k = 0. 1

6. Using the probability mass function of Binomial distribution,

   CO1- App   (16)

   Find the moment generating function of the distribution and hence find its mean and variance from moment generating function.

7. Two horses A and B were tested according to time (in seconds) to run on a particular track with the following results:

   CO2-App   (16)

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

   Analyse the given data test whether horse A is running faster than B at 5% level. Table value at 5% level is 1.796

8. Using a natural cubic spline find the polynomial function for the following data

   CO4- App   (16)

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