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

Question Paper Code: 94022

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Fourth Semester

Electronics and Communication Engineering

19UMA422 - Probability and Statistics

(Regulations 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. If A and B are independent events then $P(A \cap B)$ = CO6-U

   (a) 0 (b)P (A). P(B) (c)P(A) +P(B) (d) P(A) – P(B)

2. If A and B are mutually exclusive events then $P(A \cup B)$ = CO6-U

   (a) 0 (b)) P(A) – P(B) (c) P (A) . P(B) (d)P (A) + P(B)

3. Large sample size is _____ CO6-U

   (a) 30 (b) >30 (c) < 30 (d) none of the above

4. The degrees of freedom for the sample size n= 25 in t test is _____. CO6-U

   (a) 20 (b) 22 (c) 24 (d) 26

5. Choose the correction factor_____ CO6- U

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

6. SSE for one way design is CO6-U

   (a) 0 (b) TSS-SSC (c) TSS-SSC-SSR (d) TSS-SSC-SSR-SSK

7. If the Random Process {X(t)} with mean has Auto correlation function CO4-App $R(\tau) = 16 + 9e^{-|\tau|}$ Then the Variance of the process is

   (a) 16 (b)25 (c) 6 (d) 9

8. Autocorrelation function is maximum at τ = CO6-U

   (a) 0 (b) 1 (c) -1 (d) ∞

9. The system is said to be stable if CO6-U

(a) $\int_{-\infty}^{\infty} h(t)\ dt < \infty$ (b) $\int_{-\infty}^{\infty} h(t)\ dt > \infty$ (c) $\int_{-\infty}^{\infty} h(t)\ dt > 0$ (d) None of the above

10. If μ_x =o then find μ_y CO6-U

(a) 1 (b)0 (c)∞ (d) 10

PART – B (5 x 2= 10Marks)

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

12. A sample of size 10 has mean 58, standard deviation18.4 and population mean 50, Compute the calculated value of't' distribution. CO2-App

13. What are the basic principles in the design of experiment? CO6-U

14. State any two properties of an auto correlation function CO6-U

15. Calculate the value of the system transfer function,if the input of the system with impulse response h(t) = $e^{-\alpha t}$ U(t). CO5-App

PART – C (5 x 16= 80Marks)

16. (a) (i) Obtain the Correlation coefficient for the following heights (in inches) of fathers X and their sons Y. CO1-App (8)

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(ii) The number of monthly breakdowns of a computer is a R.V. having a Poisson distribution with mean equal to 1.8. Find the Probability that his computer will function for a month (a)Without a breakdown (b) With only one breakdown (c) With at least one breakdown CO1-App (8)

Or

(b) (i) 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)

(ii) If $f(x) = \begin{cases} \frac{k}{1+x^2}, -\infty < x < \infty \\ o \quad , elsewhere \end{cases}$ is the Probability Density Function of a Random variable X , CO1- App (8)

(i) Find K (ii) distribution function of F(x)

17. (a) Two researchers A and B adopted different techniques while rating the student's level. Identify the Sampling distribution; Can you say that the techniques adopted by them are significant? CO2-App (16)

Researchers	Below Average	Average	Above Average	Genius	Total
A	40	33	25	2	100
B	86	60	44	10	200
Total	126	93	69	12	300

Or

(b) Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables. CO2 -Ana (16)

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

Identify the sampling distribution, Do the estimates of the population variance differ significantly.

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

Brand	161	161	165	168	170	172	180	
Brand	158	164	164	170	175			
Brand	146	155	160	162	164	166	174	182
Brand	151	152	153	157	160	168		

Perform an analysis of variance test the homogeneity of the mean lives of the four brands of lamps.

Or

(b) Analyze the following of Latin square design experiment,. CO3-Ana (16)

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

The letters A,B,C,D denote the treatments and the figures in brackets denote the observations,

19. (a) (i) If the auto correlation function of the random binary transmission is given by $R_{XX}(\tau) = \begin{cases} 1 - |\tau| & ; |\tau| \le 1 \\ 0 & ; |\tau| \ge 1 \end{cases}$ Compute the Power spectral density function. CO4-App (8)

(ii) Using the properties of auto correlation function, compute the Mean , Mean Square value and Variance of $R_{xx}(\tau) = \frac{25\tau^2 + 36}{4 + 6.25\tau^2}$ CO4-App (8)

Or

(b) If the power spectral density of a continuous process is $S_{xx}(\omega) = \frac{10\,\omega^2 + 35}{(\omega^2 + 4)(\omega^2 + 9)}$, Compute the auto correlation function and the mean square value of the process CO4-App (16)

20. (a) A random process X (t) having the autocorrelation function $R_{xx}(\tau) = P\,e^{-\alpha|\tau|}$ Where Pand α are constantsis applied to the input of the system with impulse response h(t) = $e^{-bt}U(t)$ where b is a constant. Compute the autocorrelation of the output Y (t). CO5-App (16)

Or

(b) If X (t) is a WSS process and if CO5-App (16)

$$Y(t) = \int_{-\infty}^{\infty} h(u)\,X(t-u)\,du \text{ then}$$

(i). $R_{XY}(\tau) = R_{XX}(\tau) * h(\tau)$ **(ii).** $R_{YY}(\tau) = R_{XY}(\tau) * h(-\tau)$

(iii). $S_{XY}(\omega) = S_{XX}(\omega) * H(\omega)$ **(iv).** $S_{YY}(\omega) = S_{XX}(\omega) * |H(\omega)|^2$