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Question Paper Code: 94022

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

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)

- The r^{th} moment about origin is CO6-U
(a) $\mu(X)$ (b) $\mu(X^2)$ (c) $\mu(X')$ (d) None of the above
- The limiting form of a Binomial distribution is CO6-U
(a) Exponential (b) Poisson (c) Normal (d) None of the above
- Large sample size is _____ CO6-U
(a) 30 (b) >30 (c) <30 (d) none of the above
- The degrees of freedom for the sample size $n=25$ in t test is _____. CO6-U
(a) 20 (b) 22 (c) 24 (d) 26
- Choose the correction factor _____ CO6-U
(a) T^2N (b) T/N (c) T^2/N (d) TN
- SSE for Latin square design is CO6-U
(a) $TSS-SSC-SSR$ (b) $TSS-SSC$ (c) 0 (d) $TSS-SSC-SSR-SSK$
- If the Random Process $\{X(t)\}$ with mean μ 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
- Autocorrelation function is maximum at $\tau =$ 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. The average power of the auto correlation function is $R_{xx}(\tau) = 3e^{-3|\tau|}$ CO6-U
- (a) 3 (b) 6 (c) 2 (d) 0

PART – B (5 x 2= 10Marks)

11. The mean and standard deviation of the binomial distribution 20 and 4 respectively, Calculate the value of the parameter ‘n’. CO1-App
12. A sample of size 10 has mean 58, standard deviation 18.4 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. If $\mu_x = 0$ then compute the value of μ_y 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) State and Prove the memory less property for an Exponential distribution 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 (a) all are good bulbs (b) exactly three defective bulbs. CO1- App (8)

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) A completely randomized design experiment with 10 plots and 3 treatments gave the following results: CO3-Ana (16)

Plot No	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

Or

- (b) The following is a Latin square of a design, when four varieties of seeds are being tested, Analyze the given data Set up the analysis of variance table and State your conclusion. CO3-Ana (16)

A 105	B 95	C 125	D 115
C 115	D 125	A 105	B 105
D 115	C 95	B 105	A 115
B 95	A 135	D 95	C 115

19. (a) (i) If the auto correlation function of the random binary transmission CO4-App (8)

is given by
$$R_{XX}(\tau) = \begin{cases} 1 - |\tau| & ; |\tau| \leq 1 \\ 0 & ; |\tau| \geq 1 \end{cases}$$
 Compute the Power

spectral density function.

- (ii) Using the properties of auto correlation function, compute the CO4-App (8)

Mean , Mean Square value and Variance of $R_{xx}(\tau) = \frac{25\tau^2 + 36}{4 + 6.25\tau^2}$

Or

- (b) If the power spectral density of a continuous process is CO4-App (16)

$$S_{xx}(\omega) = \frac{10\omega^2 + 35}{(\omega^2 + 4)(\omega^2 + 9)}$$
, Compute the auto correlation function and

the mean square value of the process

20. (a) A random process X (t) is the input to a linear system whose impulse CO5-App (16)

response is $h(t) = 2e^{-t}$; $t \geq 0$. If the input auto correlation function of the process is $R_{xx}(\tau) = e^{-2|\tau|}$ Compute the power spectral density and auto correlation function of the output process.

Or

- (b) If the input to a time invariant stable linear system is a wide sense CO5-App (16)

stationary process. Prove that the output will also be a wide sense stationary process