Question Paper Code: 94024

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

Fourth Semester

Biomedical Engineering

19UMA424 - Probability and Inferential Statistics

(Regulation 2019)

Duration: Three Hours | Maximum: 100 Marks

PART A 10*2 =20 Marks

Answer any ten of the following questions

1. A discrete random variable X with probability distribution — CO1-App

X	0	1	2	3	4	5
P(X)	a	3a	5a	7a	9a	11a

Calculate the value of the constant 'a' .

2. Evaluate the Distribution from the mean and variance of binomial distribution are 5 and 4. — CO1-App

3. A random variable X follows an exponential distribution with parameter $\lambda = 1/5$ Calculate the value of mean . — CO1-App

4. Given X has an exponential distribution with parameter 1.Determine the pdf of $y=\sqrt{x}$? — CO2-App

5. Compute the coefficient of correlation for the following ,given The Lines of regression in a bivariate distribution are x+9y=? and y+4x=49/3 — CO2-App

6. Let f(x) = ½ ,-1≤x≤1 and let $y=x^2$ calculate the value of Cov (x,y) — CO2-App

7 Evaluate the Mean of the auto correlation function $R(\tau) = 36 + \frac{9}{1+8\tau^2}$ — CO3-App

8 Evaluate the autocorrelation value of the given power spectrum $S_{xx}(\omega) = \frac{4}{4+\omega^2}$, — CO3-App

9 Write down the Properties of Auto Correlation function — CO3-App

10 If μ_x =o find μ_y — CO6- U

11 The input of the system with impulse response $h(t) = e^{-3t}U(t)$.Evaluate The value of the system transfer function . — CO4-App

12 If X(t) is the white noise process ,Compute its power spectrum — CO4-App

13 State the condition for the Application of Chi square Test CO6-U

14 If $S_1^2 = 8.81$ and $S_2^2 = 15.40$ then calculate value of F- ratio test. CO5-App

15 Give Two Types of errors in Testing a statistical hypothesis CO5-App

PART B (5*16=80 Marks)

(Answer any Five of the following Questions)

1. 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.

2. From the following data, Compute (i) the two regression equations (ii)The coefficient of correlation between the marks in Economics and Statistics (iii) the most likely marks in Statistics when marks in Economics are 30 CO2- App (16)

Marks in Economics	25	28	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

3. If the Power spectral density of a WSS processes is given by CO3- App (16)

$$S(\omega) = \begin{cases} \frac{b}{a}(a - |\omega|) & ; \quad |\omega| \le a \\ 0 & ; \quad |\omega| > a \end{cases}$$

Determine the auto correlation function of the Process.

4. Using input and output system , If X (t) is a WSS process and CO4- App (16)

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

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

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

5.	A certain injection administered to each of 12 patients resulted in the following increases of blood pressure: 5,2,8, -1,3,0,6,-2,1,5,0,4 Analyze the data, can it be concluded that the injection will be , in general , accompanied by an increase in BP?	CO5- Ana	(16)
6.	Using the Properties of the auto correlation function, Determine the average power of a process X (t) if its power spectral density is given by $S_{xx}(\omega) = \frac{10\omega^2 + 35}{(\omega^2 + 4)(\omega^2 + 9)}$	CO3- App	(16)
7.	A random process X (t) having the autocorrelation function $R_{xx}(\tau) = P e^{-\alpha\|\tau\|}$ Where b is a constant is 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).	CO4- App	(16)
8.	Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables. Analyze the data, Do the estimates of the population variance differ significantly at 5% level?	CO5- App	(16)