SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

II B.Tech II Semester (SVEC-16) Regular/Supplementary Examinations May - 2019

PROBABILITY AND STOCHASTIC PROCESS

[Electronics and Communication Engineering]

Time: 3 hours **Max. Marks: 70**

Answer One Question from each Unit

All questions carry equal marks

UNIT-I

1	a)	A student buys 1000 integrated circuits (ICs) from supplier A, 2000 ICs from supplier B and 3000 ICs from supplier C. He tested the ICs and found that the conditional probability of an IC being defective depends on the supplier from whom it was bought. Specifically, given that an IC came from supplier A, the probability that it is defective is 0.05; given that an IC came from supplier B, the probability that it is defective is 0.10; and given that an IC came from supplier C, the probability that it is defective is 0.10. If the ICs from the three suppliers are mixed together and one is selected at random, what is the probability that it is defective? Given that a randomly selected IC is defective, what is the probability that it came from supplier A?	CO1	8 Marks
	b)	Two events A and B are such that $P[A \cap B] = 0.15$, $P[A \cup B] = 0.65$ and $P[A\|B] = 0.5$. Find $P[B\|A]$.	CO1	6 Marks

(OR)

2	a)	Define joint probability, conditional probability, mutually exclusive events with examples.	CO1	6 Marks
	b)	Let two honest coins, marked 1 and 2, be tossed together. The four possible outcomes are $T1T2$, $T1H2$, $H1T2$, $H1H2$ ($T1$ indicates toss of coin 1 resulting in tails; similarly $T2$ etc.). We shall treat that all these outcomes are equally likely; that is the probability of occurrence of any of these four outcomes is 1/4 (Treating each of these outcomes as an event, we find that these events are mutually exclusive and exhaustive). Let the event A be 'not $H1H2$' and B be the event 'match' (Match comprises the two outcomes $T1T2$, $H1H2$). Find $P(B\|A)$. Are A and B independent?	CO1	8 Marks

UNIT-II

3	a)	Let the random variable X denote the number of heads in three tosses of a fair coin. i) What is the PMF of X? And sketch the PMF. ii) Sketch the CDF of X.	CO2	7 Marks
	b)	Find the expected value of the uniform density function.	CO2	7 Marks

(OR)

4	a)	A shopping cart contains ten books whose weights are as follows: There are four books with a weight of 1.8 lbs each, one book with a weight of 2 lbs, two books with a weight of 2.5 lbs each, and three books with a weight of 3.2 lbs each. i) What is the mean weight of the books? ii) What is the variance of the weights of the books?	CO2	7 Marks
	b)	State and prove the properties of characteristic function.	CO2	7 Marks

UNIT-III

5	a)	Given two random variables X and Y with the joint CDF $FXY(x, y)$, marginal CDFs $FX(x)$ and $FY(y)$ respectively, compute the joint probability that X is greater than a and Y is greater than b.	CO2	7 Marks
	b)	The joint PMF of two random variables X and Y is given by $$P_{XY}(x,y) = \begin{cases} \frac{1}{18}(2x+y) & x=1,2; y=1,2 \\ 0 & otherwise \end{cases}$$ i) What is the conditional PMF of Y given X? ii) What is the conditional PMF of X given Y?	CO2	7 Marks

(OR)

6	a)	The joint PDF of the random variables X and Y is defined as follows: $$f_{XY}(x,y) = \begin{cases} 25e^{-5y} & 0 < x < 0.2, y > 0 \\ 0 & otherwise \end{cases}$$ i) Find the marginal PDFs of X and Y. ii) What is the covariance of X and Y ?	CO2	7 Marks
	b)	State and prove the properties of Co variance.	CO2	7 Marks

UNIT-IV

7	a)	Two random processes $X(t)$ and $Y(t)$ are defined as follows: $X(t) = A\cos(wt + \Theta)$ $Y(t) = B\sin(wt + \Theta)$ where A, B and $\boldsymbol{w}$ are constants and Θ is a random variable that is uniformly distributed between 0 and 2. Find the cross correlation function of $X(t)$ and $Y(t)$.	CO3	7 Marks
	b)	State and prove the properties of auto correlation.	CO3	7 Marks

(OR)

8	a)	A random process has sample functions of the form $$X(t) = A\cos(wt + \Theta)$$ where $\boldsymbol{w}$ is constant, A is a random variable that has a magnitude of +1 and −1 with equal probability, and Θ is a random variable that is uniformly distributed between 0 and $2\boldsymbol{\pi}$. Assume that the random variables A and Θ are independent.	CO3	7 Marks
	b)	If $Y_1(t)=X_1\cos\omega t+X_2\sin\omega t$ $Y_2(t)=X_1\sin\omega t+X_2\cos\omega t$ Where X_1 and X_2 are zero means independent random variables with unity variance. Show that the random processes $Y_1(t)$ and $Y_2(t)$ are individually **ωss** but not jointly WSS	CO3	7 Marks

UNIT-V

9	a)	Classify noise and explain.	CO1	7 Marks
	b)	Derive the noise figure is cascade amplifiers.	CO3	7 Marks

(OR)

10	a)	Obtain the expression for noise figure in terms of equivalent noise temperature for an amplifier	CO3	7 Marks
	b)	Mention the differences between correlated and uncorrelated noise.	CO1	7 Marks

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