Exam.Code:0928
Sub. Code: 6586

2053

B.E. (Electronics and Communication Engineering)

Fourth Semester

EC-407: Probability and Random Processes

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

Q.1a)	If X(t) is a random process, what is the power of X(t) in frequency band $[F_1,F_2]$.	(2×5)
b)	Differentiate between stationary, nonstationary and wide sense stationary processes.	
c)	If $f(x,y) = C(x^2 + 7y)$, check whether X and Y are independent random variables. Give justification.	
d)	Find the capacity of the Binary Symmetric Channel when probability p is given as 0.6.	
e)	The given channel is symmetric. Comment. $P(Y/X) = \begin{bmatrix} 0.4 & 0.6 \\ 0.3 & 0.7 \\ 0.6 & 0.4 \\ 0.7 & 0.3 \end{bmatrix}$	
	Section A	
Q.2a)	Define the term expectation. If X is a continuous random variable with pdf $f(x) = \frac{2}{x^3}$; $x \geq 1$, 0 ; $x < 1$. Find the Expectation of x.	(5)
b)	State and prove the Bayes Theorem.	(5)
Q.3	a. Explain the two characteristics of Normal distribution. b. State strict sense and wide sense stationary process. c. When is random process said to be ergodic. Give an example of ergodic process.	(10)
Q.4	The joint probability function of two discrete random variables X and Y is given as fXY(x,y)= C(5x+y) for 0≤x≤2, 0≤y≤3 0 elsewhere a. Find C. b.P(X=2, Y=3) c. marginal probability functions of X and Y. d. f(2/y)	(10)
	Section B	
Q.5a)	A Gaussian channel has 1 MHz bandwidth. Calculate the channel capacity if the signal power to noise spectral density ratio is 10^5. Also find the maximum information rate.	(5)
b)	What is noise figure? How Friss equation and noise figure related. Derive an expression to prove the relation.	(5)
Q.6a)	State and prove Shannon Hartley Theorem.	(5)
b)	Prove I(X;Y) = H(X)+ H(Y) -H(X,Y).	(5)
Q.7	Apply the Shannon Fano Coding to find the efficiency of the following message ensemble: [X] = [x1, x2, x3, x4, x5, x6, x7] [P] = [0.4, 0.2, 0.12, 0.08, 0.08, 0.08, 0.04]	(10)

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