R09

Code No: C9303, C4504

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I - SEMESTER EXAMINATIONS, APRIL/MAY-2012
RANDOM PROCESSES AND TIME SERIES ANALYSIS
(SYSTEMS AND SIGNAL PROCESSING)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1.a) Derive the probability distribution function of sum of two random variables.

b) The joint distribution of X and Y is given by f(x) = $4xye^{-(x^2+y^2)}$; $x \geq 0,\ y \geq 0$ show that X and Y are independent random variables.

2.a) Explain the simulation procedure to generate exponential random variates.

b) A random process Y(t) is given as Y(t) = $X(t)C\text{os}(\omega t + \theta)$, where X(t) is a wide sense stationary random process, 'ω' is a random phase independent of X(t), uniformly distributed on $(\pi, -\pi)$. Find out $R_{YY}(t)$.

3.a) What is a stationary random process? State the conditions for jointly wide-sense stationary processes.

b) A random process is given as X(t) = At, where A is uniformly distributed random variable on (0, 2). Find whether X(t) is WSS or not.

4.a) Derive the relationship between cross powder spectral density and cross correlation function.

b) The power spectral density of a stationary random process is given by $S_{XY}(\omega) = \begin{cases} A, & -K < \omega < K \\ 0, & otherwise \end{cases}$. Determine the auto correlation function and mean square value.

5.a) Derive the relationship between power spectral densities of input and output random process of an LTI system.

b) A random process X(t) whose mean value is 2 and autocorrelation function is $R_{XX}(z) = 4e^{-2|z|}$ is applied to a system whose transfer function is $\frac{1}{2 + j\omega}$. Find out power spectral density and average power of output signal.

6.a) Distinguish between Markov processes and random processes.

b) State and prove Chapman-kolmogorov equation.

7.a) Derive an expression of the average number of busy servers in M/M/m queuing system.

b) The capacity of a wireless communication channel is 20kbps. This channel is used to transmit 8-bit characters, so the maximum rate is 2500 characters per second. The application calls for traffic from many devices to be sent on the channel with a total volume of 120,000 characters per minute. Calculate the average number of characters waiting to be transmitted and the average transmission time (including quenching delay) per character.

8. Write short notes on: a) Gaussian Process b) Classification of states
c) Gamblers rules in Markov chains.

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