Code No: R05210401 **R05** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
PROBABILITY THEORY AND STOCHASTIC PROCESSES
Common to Electronics And Computer Engineering, Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) State & Prove any four properties of band limited processes. [4×3=12]
   (b) White noise with power density No/2 is applied to a network with impulse response h(t) = u(t) ωt exp (ω- t). Where $\omega > 0$ is a constant. Find the correlations of input & output. [4]

2. A random process Y(t) = X(t)- X(t +τ) is defined in terms of a process X(t) that is at least wide sense stationary.
   (a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value.
   (b) Show that $\sigma Y^2 = 2[R_{XX}(0) - R_{XX}(\tau)]$
   (c) If Y(t) = X(t) +X(t + τ) find E[Y(t)] and σY^2. [5+5+6]

3. (a) For two zero mean Gaussian random variables X and Y show that their joint characteristic function is
   $\phi XY(\omega_1,\omega_2) = \exp\{-1/2[\sigma X^2\omega_1^2+2\rho\sigma_X\sigma_Y\omega_1\omega_2+\sigma Y^2\omega_2^2]\}$.
   (b) Statistically independent random variables X and Y have moments $m_{10} = 2$, $m_{20} = 14$, $m_{02} = 12$ and m_{11} = -6 find the moment μ_{22}
   (c) Two Gaussian random variables X and Y have variances $\sigma X^2 = 9$ and $\sigma Y^2 = 4$, respectively and correlation coefficient ρ. It is known that a coordinate rotation by an angle $\Pi/8$ results in new random variables Y_1 and Y_2 that are uncorrelated. what is ρ. [8+4+4]

4. (a) Joint probabilities of two random variables X and Y are given in table3a

Y \ X	1	2	3
1	1/7	3/28	1/14
2	1/7	3/28	1/14
3	1/14	2/14	1/7

Table 3a

   Find

i. P(X ≤ 1.5)
ii. XY is even
iii. Y is odd given that X is even.

(b) The probability density functions of two statistically independent random variables X and Y are given by $f_X(x) = \ xe^{-x} \quad x > 0 \qquad f_Y(y) = \begin{cases} 1 & 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$
Find the probability distribution and density functions of W = XY. [8+8]

5. (a) What is an event and explain discrete and continuous events with an example.
(b) Discuss joint and conational probability.
(c) Determine the probability of a card being either red or a queen. [6+6+4]

6. (a) Define and explain characteristic function and moment generating function of the random variable X .
(b) A random variable X has the density function. $f_X(x) = \ \frac{1}{2}e^{-|x|} \quad -\infty \leq x \leq \infty$
Find E[X], E[X^2] and variance. [8+8]

7. (a) Define cumulative probability distribution function. And discuss distribution function's specific properties.
(b) What are the conditions for the function to be a random variable? Discuss. What do you mean by continuous and discrete random variable? [8+8]

8. (a) Derive the expression for PSD and ACF of band pass white noise and plot them
(b) Define various types of noise and explain. [8+8]

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Code No: R05210401 **R05** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
PROBABILITY THEORY AND STOCHASTIC PROCESSES
Common to Electronics And Computer Engineering, Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define and explain characteristic function and moment generating function of the random variable X .

   (b) A random variable X has the density function. $f_X(x) = \frac{1}{2}e^{-|x|} \quad -\infty \leq x \leq \infty$ Find E[X], E[X^2] and variance. [8+8]

2. (a) Joint probabilities of two random variables X and Y are given in table3a

Y \ X	1	2	3
1	1/7	3/28	1/14
2	1/7	3/28	1/14
3	1/14	2/14	1/7

Table 3a

   Find

   i. P(X ≤ 1.5)
   ii. XY is even
   iii. Y is odd given that X is even.

   (b) The probability density functions of two statistically independent random variables X and Y are given by $f_X(x) = \quad xe^{-x} \quad x > 0 \qquad f_Y(y) = \begin{cases} 1 & 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$
   Find the probability distribution and density functions of W = XY. [8+8]

3. (a) Derive the expression for PSD and ACF of band pass white noise and plot them

   (b) Define various types of noise and explain. [8+8]

4. (a) What is an event and explain discrete and continuous events with an example.

   (b) Discuss joint and conational probability.

   (c) Determine the probability of a card being either red or a queen. [6+6+4]

5. A random process Y(t) = X(t)- X(t $+\tau$) is defined in terms of a process X(t) that is at least wide sense stationary.

   (a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value.

   (b) Show that $\sigma Y^2 = 2[R_{XX}(0) - R_{XX}(\tau)]$

   (c) If Y(t) = X(t) +X(t + τ) find E[Y(t)] and σY^2. [5+5+6]

6. (a) State & Prove any four properties of band limited processes. [4×3=12]

   (b) White noise with power density No/2 is applied to a network with impulse response h(t) = u(t) ωt exp (ω- t). Where $\omega > 0$ is a constant. Find the correlations of input & output. [4]

7. (a) For two zero mean Gaussian random variables X and Y show that their joint characteristic function is
   $\phi XY(\omega_1,\omega_2) = \exp\{-1/2[\sigma X^2\omega_1^2 + 2\rho\sigma_X\sigma_Y\omega_1\omega_2 + \sigma Y^2\omega_2^2]\}$.

   (b) Statistically independent random variables X and Y have moments $m_{10} = 2$, $m_{20} = 14$, $m_{02} = 12$ and m_{11} = -6 find the moment μ_{22}

   (c) Two Gaussian random variables X and Y have variances $\sigma X^2 = 9$ and $\sigma Y^2 = 4$, respectively and correlation coefficient ρ. It is known that a coordinate rotation by an angle $\Pi/8$ results in new random variables Y_1 and Y_2 that are uncorrelated. what is ρ. [8+4+4]

8. (a) Define cumulative probability distribution function. And discuss distribution function's specific properties.

   (b) What are the conditions for the function to be a random variable? Discuss. What do you mean by continuous and discrete random variable? [8+8]

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Code No: R05210401 **R05** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
PROBABILITY THEORY AND STOCHASTIC PROCESSES
Common to Electronics And Computer Engineering, Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State & Prove any four properties of band limited processes. [4×3=12]
   (b) White noise with power density No/2 is applied to a network with impulse response h(t) = u(t) ωt exp (ω- t). Where $\omega>$ 0 is a constant. Find the correlations of input & output. [4]

2. (a) What is an event and explain discrete and continuous events with an example.
   (b) Discuss joint and conational probability.
   (c) Determine the probability of a card being either red or a queen. [6+6+4]

3. (a) Define and explain characteristic function and moment generating function of the random variable X .
   (b) A random variable X has the density function. $f_X(x) = \frac{1}{2}e^{-|x|} \quad -\infty \leq x \leq \infty$ Find E[X], E[X^2] and variance. [8+8]

4. (a) Define cumulative probability distribution function. And discuss distribution function's specific properties.
   (b) What are the conditions for the function to be a random variable? Discuss. What do you mean by continuous and discrete random variable? [8+8]

5. A random process Y(t) = X(t)- X(t +τ) is defined in terms of a process X(t) that is at least wide sense stationary.
   (a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value.
   (b) Show that σY^2= 2[R$_{XX}$(0) − R$_{XX}$(τ)]
   (c) If Y(t) = X(t) +X(t + τ) find E[Y(t)] and σY^2. [5+5+6]

6. (a) Derive the expression for PSD and ACF of band pass white noise and plot them
   (b) Define various types of noise and explain. [8+8]

7. (a) Joint probabilities of two random variables X and Y are given in table3a

Y \ X	1	2	3
1	1/7	3/28	1/14
2	1/7	3/28	1/14
3	1/14	2/14	1/7

Table 3a

Find

i. P(X $\leq$ 1.5)
ii. XY is even
iii. Y is odd given that X is even.

(b) The probability density functions of two statistically independent random variables X and Y are given by $f_X(x) = xe^{-x} \quad x > 0 \qquad f_Y(y) = \begin{cases} 1 & 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$
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(b) Statistically independent random variables X and Y have moments $m_{10} = 2$, $m_{20} = 14$, $m_{02} = 12$ and $m_{11} =$ -6 find the moment μ_{22}

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Code No: R05210401 **R05** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
PROBABILITY THEORY AND STOCHASTIC PROCESSES
Common to Electronics And Computer Engineering, Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours Max Marks: 80

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1. (a) What is an event and explain discrete and continuous events with an example.
   (b) Discuss joint and conational probability.
   (c) Determine the probability of a card being either red or a queen. [6+6+4]

2. (a) Derive the expression for PSD and ACF of band pass white noise and plot them
   (b) Define various types of noise and explain. [8+8]

3. (a) Joint probabilities of two random variables X and Y are given in table3a

Y \ X	1	2	3
1	1/7	3/28	1/14
2	1/7	3/28	1/14
3	1/14	2/14	1/7

Table 3a

Find
   i. P(X $\leq$ 1.5)
   ii. XY is even
   iii. Y is odd given that X is even.

   (b) The probability density functions of two statistically independent random variables X and Y are given by $f_X(x) = \quad xe^{-x} \quad x > 0 \qquad f_Y(y) = \begin{cases} 1 & 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$
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4. (a) For two zero mean Gaussian random variables X and Y show that their joint characteristic function is
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   (b) Statistically independent random variables X and Y have moments $m_{10} = 2$, $m_{20} = 14$, $m_{02} = 12$ and m_{11} = -6 find the moment μ_{22}

(c) Two Gaussian random variables X and Y have variances $\sigma X^2 = 9$ and $\sigma Y^2 = 4$, respectively and correlation coefficient ρ. It is known that a coordinate rotation by an angle $\Pi/8$ results in new random variables Y_1 and Y_2 that are uncorrelated. what is ρ. [8+4+4]

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