Code No: 07A3EC10 **R07** **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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) A joind pdf is
$$f_{x,y}(x,y) = \begin{cases} \frac{1}{ab} & 0 < x < a, 0 < y < b \\ 0 & elsewhere \end{cases}$$
   i. Find and sketch $F_{x,y}$(x,y)
   ii. If a < b find $P\left[X + Y \leq \frac{3a}{4}\right]$

   (b) Find a value of const b so that $f_{x,y}$(x,y) = bxy^2 exp(-2xy)u(x-2)u(y-1) is valid joint pdf. [10+6]

2. (a) The joint probability function of two R.V's X & Y is given by
$$f(x,y) = \begin{cases} c(x^2+2y) & \begin{matrix} x = 0,1,2 \\ y = 1,2,3,4 \end{matrix} \\ 0 & otherwise \end{cases}$$ find
   i. The value of C
   ii. P(x=2, y=3)
   iii. P(x≤1, y>2)
   iv. Mariginal probability function of X & Y.

   (b) Show that when n is very large (n>>k) and P very small the binomial distribution approximates poisson distribution. [10+6]

3. (a) Explain the terms Joint probability and Conditional probability.
   (b) Show that Conditional probability satisfies the three axioms of probability.
   (c) Two cards are drawn from a 52-card deck (the first is not replaced):
   i. Given the first card is a queen. What is the probability that the second is also a queen?
   ii. Repeat part (i) for the first card a queen and second card a 7.
   iii. What is the probability that both cards will be the queen? [4+6+6]

4. (a) Prove that $R_{YY}(\tau) = R_{XY}(\tau) * h(-\tau)$
   (b) Prove that $R_{YY}(\tau) = R_{YX}(\tau) * h(\tau)$ [8+8]

5. (a) A WSS random process X(t) has $R_{XX}(\tau) = A_0\left[1 - \frac{|t|}{\tau}\right] \quad -\tau \leq t \leq \tau$
   $= 0$ else where

   Find power density spectrum.

(b) $R_{XX}(\tau) = \frac{A_0^2}{2}\sin\omega_0\tau$. Find $S_{xx}(\omega)$ [8+8]

6. (a) Explain about the moment generating function of a random variable.
   (b) Find the moment generating function of the following.
      i. Y = ax+b
      ii. $Y = \frac{x+a}{b}$ [8+8]

7. For random variables X and Y having $\bar{X}$=1, $\bar{Y}$ =2, σ_x^2=6, $\sigma_Y^2 = 9$ and ρ = -2/3. Find:
   (a) The covariance of X and Y
   (b) The covariance of X and Y
   (c) The moments m_{20} and m_2. [16]

8. (a) Present at least five properties of autocorrelation function of a random process X(t) and prove any two of them.
   (b) $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find mean and variance of random process X(t).[10+6]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A3EC10 **R07** **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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Present at least five properties of autocorrelation function of a random process X(t) and prove any two of them.

   (b) $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find mean and variance of random process X(t). [10+6]

2. (a) Explain the terms Joint probability and Conditional probability.

   (b) Show that Conditional probability satisfies the three axioms of probability.

   (c) Two cards are drawn from a 52-card deck (the first is not replaced):

      i. Given the first card is a queen. What is the probability that the second is also a queen?
      ii. Repeat part (i) for the first card a queen and second card a 7.
      iii. What is the probability that both cards will be the queen? [4+6+6]

3. (a) Prove that $R_{YY}(\tau) = R_{XY}(\tau) * h(-\tau)$

   (b) Prove that $R_{YY}(\tau) = R_{YX}(\tau) * h(\tau)$ [8+8]

4. (a) The joint probability function of two R.V's X & Y is given by

   $$f(x,y) = \begin{cases} c(x^2+2y) & \begin{array}{l} x = 0,1,2 \\ y = 1,2,3,4 \end{array} \\ 0 & otherwise \end{cases} \quad \text{find}$$

      i. The value of C
      ii. P(x=2, y=3)
      iii. P(x≤1, y>2)
      iv. Mariginal probability function of X & Y.

   (b) Show that when n is very large (n>>k) and P very small the binomial distribution approximates poisson distribution. [10+6]

5. (a) A joind pdf is

   $$f_{x,y}(x,y) = \begin{cases} \frac{1}{ab} & 0 < x < a, 0 < y < b \\ 0 & elsewhere \end{cases}$$

      i. Find and sketch $F_{x,y}(x,y)$
      ii. If a < b find $P\left[X + Y \le \frac{3a}{4}\right]$

   (b) Find a value of const b so that $f_{x,y}(x,y) = bxy^2 \exp(-2xy)u(x-2)u(y-1)$ is valid joint pdf. [10+6]

6. For random variables X and Y having $\bar{X}$=1, $\bar{Y}$ =2, σ_x^2=6, $\sigma_Y^2 = 9$ and ρ = -2/3. Find:
   (a) The covariance of X and Y
   (b) The covariance of X and Y
   (c) The moments m_{20} and m_2. [16]

7. (a) A WSS random process X(t) has $R_{XX}(\tau) = A_0\left[1 - \frac{|t|}{\tau}\right] - \tau \le t \le \tau$
   $= 0$ else where

   Find power density spectrum.

   (b) $R_{XX}(\tau) = \frac{A_0^2}{2}\sin\omega_0\tau$. Find $S_{xx}(\omega)$ [8+8]

8. (a) Explain about the moment generating function of a random variable.
   (b) Find the moment generating function of the following.
      i. Y = ax+b
      ii. $Y = \frac{x+a}{b}$ [8+8]

⋆⋆⋆⋆⋆

Code No: 07A3EC10 **R07** **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
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Prove that $R_{YY}(\tau) = R_{XY}(\tau) * h(-\tau)$
   (b) Prove that $R_{YY}(\tau) = R_{YX}(\tau) * h(\tau)$ [8+8]

2. (a) Explain about the moment generating function of a random variable.
   (b) Find the moment generating function of the following.
      i. Y = ax+b
      ii. $Y = \frac{x+a}{b}$ [8+8]

3. (a) Explain the terms Joint probability and Conditional probability.
   (b) Show that Conditional probability satisfies the three axioms of probability.
   (c) Two cards are drawn from a 52-card deck (the first is not replaced):
      i. Given the first card is a queen. What is the probability that the second is also a queen?
      ii. Repeat part (i) for the first card a queen and second card a 7.
      iii. What is the probability that both cards will be the queen? [4+6+6]

4. (a) The joint probability function of two R.V's X & Y is given by

$$f(x,y) = \begin{cases} c(x^2+2y) & \begin{array}{l} x = 0,1,2 \\ y = 1,2,3,4 \end{array} \\ 0 & otherwise \end{cases} \quad \text{find}$$

      i. The value of C
      ii. P(x=2, y=3)
      iii. P(x≤1, y>2)
      iv. Mariginal probability function of X & Y.
   (b) Show that when n is very large (n>>k) and P very small the binomial distribution approximates poisson distribution. [10+6]

5. (a) Present at least five properties of autocorrelation function of a random process X(t) and prove any two of them.
   (b) $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find mean and variance of random process X(t).[10+6]

6. (a) A WSS random process X(t) has $R_{XX}(\tau) = A_0\left[1 - \frac{|\,|}{\tau}\right] \quad -\tau \le t \le \tau$
$\qquad\qquad = 0 \qquad$ else where

   Find power density spectrum.

(b) $R_{XX}(\tau) = \frac{A_0^2}{2}\sin\omega_0\tau$. Find $S_{xx}(\omega)$ [8+8]

7. (a) A joind pdf is
   $$f_{x,y}(x,y) = \begin{cases} \frac{1}{ab} & 0 < x < a, 0 < y < b \\ 0 & elsewhere \end{cases}$$
   i. Find and sketch $F_{x,y}$(x,y)
   ii. If a < b find $P\left[X + Y \leq \frac{3a}{4}\right]$

   (b) Find a value of const b so that $f_{x,y}$(x,y) = bxy^2 exp(-2xy)u(x-2)u(y-1) is valid joint pdf. [10+6]

8. For random variables X and Y having $\bar{X}$=1, $\bar{Y}$ =2, σ_x^2=6, σ_Y^2 = 9 and ρ = -2/3. Find:
   (a) The covariance of X and Y
   (b) The covariance of X and Y
   (c) The moments m_{20} and m_2. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A3EC10 **R07** **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

Answer any FIVE Questions
All Questions carry equal marks
⋆⋆⋆⋆⋆

1. (a) Explain the terms Joint probability and Conditional probability.
   (b) Show that Conditional probability satisfies the three axioms of probability.
   (c) Two cards are drawn from a 52-card deck (the first is not replaced):
      i. Given the first card is a queen. What is the probability that the second is also a queen?
      ii. Repeat part (i) for the first card a queen and second card a 7.
      iii. What is the probability that both cards will be the queen? [4+6+6]

2. (a) Present at least five properties of autocorrelation function of a random process X(t) and prove any two of them.
   (b) $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find mean and variance of random process X(t).[10+6]

3. (a) Prove that $R_{YY}(\tau) = R_{XY}(\tau) * h(-\tau)$
   (b) Prove that $R_{YY}(\tau) = R_{YX}(\tau) * h(\tau)$ [8+8]

4. (a) Explain about the moment generating function of a random variable.
   (b) Find the moment generating function of the following.
      i. Y = ax+b
      ii. $Y = \frac{x+a}{b}$ [8+8]

5. For random variables X and Y having $\bar{X}$=1, $\bar{Y}$ =2, σ_x^2=6, σ_Y^2 = 9 and ρ = -2/3. Find:
   (a) The covariance of X and Y
   (b) The covariance of X and Y
   (c) The moments m_{20} and m_2. [16]

6. (a) A WSS random process X(t) has $R_{XX}(\tau) = A_0\left[1 - \frac{|t|}{\tau}\right] - \tau \leq t \leq \tau$
   $= 0$ else where
   Find power density spectrum.
   (b) $R_{XX}(\tau) = \frac{A_0^2}{2}\sin\omega_0\tau$. Find $S_{xx}(\omega)$ [8+8]

7. (a) A joind pdf is
   $$f_{x,y}(x,y) = \begin{cases} \frac{1}{ab} & 0 < x < a, 0 < y < b \\ 0 & elsewhere \end{cases}$$

i. Find and sketch $F_{x,y}(x,y)$

ii. If a < b find $P\left[X+Y \leq \frac{3a}{4}\right]$

(b) Find a value of const b so that $f_{x,y}(x,y) = bxy^2 \exp(-2xy)u(x-2)u(y-1)$ is valid joint pdf. [10+6]

8. (a) The joint probability function of two R.V's X & Y is given by

$$f(x,y) = \begin{cases} c(x^2+2y) & \begin{matrix} x = 0,1,2 \\ y = 1,2,3,4 \end{matrix} \\ 0 & otherwise \end{cases} \quad \text{find}$$

i. The value of C

ii. P(x=2, y=3)

iii. P(x≤1, y>2)

iv. Mariginal probability function of X & Y.

(b) Show that when n is very large (n>>k) and P very small the binomial distribution approximates poisson distribution. [10+6]

⋆ ⋆ ⋆ ⋆ ⋆