Code No: NR221201   **NR**   **Set No. 2**

II B.Tech II Semester Examinations,December 2010
COMMUNICATION THEORY
Information Technology

Time: 3 hours   Max Marks: 80

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

1. (a) Define the terms (i) Quantization Error and Inter symbol interference in Digital communication and discuss the reasons for their existence.

   (b) What is Delta modulation? Compare Delta modulation with PCM and bring out its merits and demerits.   [8+8]

2. (a) Explain the principle of balanced frequency discriminator with its diagram.

   (b) A sinusoidal modulating wave of amplitude 10v, and frequency 5KHz is applied to a frequency modulator. The frequency sensitivity of the modulator is 45Hz/v, the carrier frequency is 150KHz. Calculate its frequency deviation and modulation index.

   (c) Show that the average power of FM is constant.   [8+4+4]

3. (a) Define and explain the significance of the terms :

      i. amount of Information,
      ii. Average information,
      iii. entropy and information rate,
      iv. List out their units.

   (b) For a binary memoryless source, emitting symbols 0 and 1 with probabilities of p_0 and p_1 respectively, evaluate the entropy and sketch the entropy function. Explain the properties of the entropy function.   [8+8]

4. (a) What is cross talk? Explain the reasons for cross talk in sampled signals and suggest methods to minimize cross talk.

   (b) Explain clearly ideal sampling and natural sampling and derive expression for the spectrum of naturally sampled signal with pulse width z.   [6+10]

5. (a) Use the duality theorem to show that
      Asinc $2\omega t \leftrightarrow (A/2\omega)\pi(f/2\omega)$

   (b) Use the differentiation theorem to obtain the Fourier transform of the triangular signal defined as,   [6+10]
   $$\lambda(t/\tau) = \begin{cases} 1 - \dfrac{|t|}{\tau}, & |t| < \tau \\ 0, & otherwise \end{cases}$$

6. (a) Write the properties of the distribution function of a random variable.

1

$\boxed{\textbf{NR}}$ $\boxed{\textbf{Set No. 2}}$

(b) A random variable X has a Variance σ^2 and a mean m. The random Variable Y is related to X by Y = aX+b, Where a and b are contants, Find the mean and Variance of Y.

(c) Calculate the variance of the random variable having densities: [2+7+7]

    i. The gaussian density fX_1 (x) = (1/ $\sqrt{2\pi}$) $e^{-(X-m)^{\wedge 2/2}}$, all x.

    ii. The Raleigh density fx_2 (x) = x $e^{-X^{\wedge 2/2}}$, $X \geq 0$.

7. (a) For (7,4) block code, determine the generator matrix. Decode the code word 1101101.

  (b) Explain the following: [8+8]

    i. Code efficiency,

    ii. Noiseless-coding theorem.

8. (a) Derive an expression for the output power of AM transmitter in terms of depth of modulation.

  (b) Explain the method of generating AM wave with its block diagram. [8+8]

$\star\star\star\star\star$

Code No: NR221201   **NR**   **Set No. 4**

II B.Tech II Semester Examinations,December 2010
COMMUNICATION THEORY
Information Technology

Time: 3 hours   Max Marks: 80

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

1. (a) Define and explain the significance of the terms :

   i. amount of Information,
   ii. Average information,
   iii. entropy and information rate,
   iv. List out their units.

   (b) For a binary memoryless source, emitting symbols 0 and 1 with probabilities of p_0 and p_1 respectively, evaluate the entropy and sketch the entropy function. Explain the properties of the entropy function.   [8+8]

2. (a) For (7,4) block code, determine the generator matrix. Decode the code word 1101101.

   (b) Explain the following: [8+8]

   i. Code efficiency,
   ii. Noiseless-coding theorem.

3. (a) Derive an expression for the output power of AM transmitter in terms of depth of modulation.

   (b) Explain the method of generating AM wave with its block diagram.   [8+8]

4. (a) Write the properties of the distribution function of a random variable.

   (b) A random variable X has a Variance σ^2 and a mean m. The random Variable Y is related to X by Y = aX+b, Where a and b are contants, Find the mean and Variance of Y.

   (c) Calculate the variance of the random variable having densities: [2+7+7]

   i. The gaussian density $fX_1(x) = (1/\sqrt{2\pi})\ e^{-(X-m)^{\wedge 2/2}}$, all x.
   ii. The Raleigh density $fx_2(x) = x\ e^{-X^{\wedge 2/2}}$, $X \geq 0$.

5. (a) Explain the principle of balanced frequency discriminator with its diagram.

   (b) A sinusoidal modulating wave of amplitude 10v, and frequency 5KHz is applied to a frequency modulator. The frequency sensitivity of the modulator is 45Hz/v, the carrier frequency is 150KHz. Calculate its frequency deviation and modulation index.

   (c) Show that the average power of FM is constant.   [8+4+4]

3

6. (a) What is cross talk? Explain the reasons for cross talk in sampled signals and suggest methods to minimize cross talk.

   (b) Explain clearly ideal sampling and natural sampling and derive expression for the spectrum of naturally sampled signal with pulse width z. [6+10]

7. (a) Use the duality theorem to show that
   Asinc $2\omega t \leftrightarrow (A/2\omega)\pi(f/2\omega)$

   (b) Use the differentiation theorem to obtain the Fourier transform of the triangular signal defined as, [6+10]

   $$\lambda(t/\tau) = \begin{cases} 1 - \dfrac{|t|}{\tau}, & |t| < \tau \\ 0 \;, & otherwise \end{cases}$$

8. (a) Define the terms (i) Quantization Error and Inter symbol interference in Digital communication and discuss the reasons for their existence.

   (b) What is Delta modulation? Compare Delta modulation with PCM and bring out its merits and demerits. [8+8]

⋆⋆⋆⋆⋆

4

Code No: NR221201 | **NR** | **Set No. 1**

II B.Tech II Semester Examinations,December 2010
COMMUNICATION THEORY
Information Technology

Time: 3 hours   Max Marks: 80

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

1. (a) For (7,4) block code, determine the generator matrix. Decode the code word 1101101.

   (b) Explain the following: [8+8]

      i. Code efficiency,

      ii. Noiseless-coding theorem.

2. (a) Use the duality theorem to show that
       Asinc $2\omega t \leftrightarrow (A/2\omega)\pi(f/2\omega)$

   (b) Use the differentiation theorem to obtain the Fourier transform of the trian-
       gular signal defined as,   [6+10]
       $$\lambda(t/\tau) = \begin{cases} 1 - \dfrac{|t|}{\tau}, & |t| < \tau \\ 0, & otherwise \end{cases}$$

3. (a) Define the terms (i) Quantization Error and Inter symbol interference in Dig-
       ital communication and discuss the reasons for their existence.

   (b) What is Delta modulation? Compare Delta modulation with PCM and bring
       out its merits and demerits.   [8+8]

4. (a) Write the properties of the distribution function of a random variable.

   (b) A random variable X has a Variance σ^2 and a mean m. The random Variable
       Y is related to X by Y = aX+b, Where a and b are contants, Find the mean
       and Variance of Y.

   (c) Calculate the variance of the random variable having densities: [2+7+7]

      i. The gaussian density $fX_1(x) = (1/\sqrt{2\pi})\ e^{-(X-m)^{\wedge 2/2}}$, all x.

      ii. The Raleigh density $fx_2(x) = x\ e^{-X^{\wedge 2/2}}$, $X \geq 0$.

5. (a) What is cross talk? Explain the reasons for cross talk in sampled signals and
       suggest methods to minimize cross talk.

   (b) Explain clearly ideal sampling and natural sampling and derive expression for
       the spectrum of naturally sampled signal with pulse width z.   [6+10]

6. (a) Define and explain the significance of the terms :

      i. amount of Information,

      ii. Average information,

5

       iii. entropy and information rate,

       iv. List out their units.

(b) For a binary memoryless source, emitting symbols 0 and 1 with probabilities of p_0 and p_1 respectively, evaluate the entropy and sketch the entropy function. Explain the properties of the entropy function.   [8+8]

7. (a) Derive an expression for the output power of AM transmitter in terms of depth of modulation.

  (b) Explain the method of generating AM wave with its block diagram.   [8+8]

8. (a) Explain the principle of balanced frequency discriminator with its diagram.

  (b) A sinusoidal modulating wave of amplitude 10v, and frequency 5KHz is applied to a frequency modulator. The frequency sensitivity of the modulator is 45Hz/v, the carrier frequency is 150KHz. Calculate its frequency deviation and modulation index.

  (c) Show that the average power of FM is constant.   [8+4+4]

$\star\star\star\star\star$

6

Code No: NR221201   **NR**   **Set No. 3**

II B.Tech II Semester Examinations,December 2010
COMMUNICATION THEORY
Information Technology

Time: 3 hours   Max Marks: 80

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

1. (a) Explain the principle of balanced frequency discriminator with its diagram.

   (b) A sinusoidal modulating wave of amplitude 10v, and frequency 5KHz is applied to a frequency modulator. The frequency sensitivity of the modulator is 45Hz/v, the carrier frequency is 150KHz. Calculate its frequency deviation and modulation index.

   (c) Show that the average power of FM is constant.   [8+4+4]

2. (a) What is cross talk? Explain the reasons for cross talk in sampled signals and suggest methods to minimize cross talk.

   (b) Explain clearly ideal sampling and natural sampling and derive expression for the spectrum of naturally sampled signal with pulse width z.   [6+10]

3. (a) Write the properties of the distribution function of a random variable.

   (b) A random variable X has a Variance σ^2 and a mean m. The random Variable Y is related to X by Y = aX+b, Where a and b are contants, Find the mean and Variance of Y.

   (c) Calculate the variance of the random variable having densities: [2+7+7]
       i. The gaussian density $fX_1(x) = (1/\sqrt{2\pi}) e^{-(X-m)^{\wedge 2/2}}$, all x.
       ii. The Raleigh density $fx_2(x) = x\, e^{-X^{\wedge 2/2}}$, $X \geq 0$.

4. (a) Use the duality theorem to show that
       Asinc $2\omega t \leftrightarrow (A/2\omega)\pi(f/2\omega)$

   (b) Use the differentiation theorem to obtain the Fourier transform of the triangular signal defined as,   [6+10]
   $$\lambda(t/\tau) = \begin{cases} 1 - \dfrac{|t|}{\tau}, & |t| < \tau \\ 0, & otherwise \end{cases}$$

5. (a) For (7,4) block code, determine the generator matrix. Decode the code word 1101101.

   (b) Explain the following: [8+8]
       i. Code efficiency,
       ii. Noiseless-coding theorem.

6. (a) Define the terms (i) Quantization Error and Inter symbol interference in Digital communication and discuss the reasons for their existence.

(b) What is Delta modulation? Compare Delta modulation with PCM and bring out its merits and demerits. [8+8]

7. (a) Derive an expression for the output power of AM transmitter in terms of depth of modulation.

(b) Explain the method of generating AM wave with its block diagram. [8+8]

8. (a) Define and explain the significance of the terms :

   i. amount of Information,
   ii. Average information,
   iii. entropy and information rate,
   iv. List out their units.

(b) For a binary memoryless source, emitting symbols 0 and 1 with probabilities of p_0 and p_1 respectively, evaluate the entropy and sketch the entropy function. Explain the properties of the entropy function. [8+8]

$\star\star\star\star\star$