Code No: 07A6EC12 **R07** **Set No. 2**

III B.Tech II Semester Examinations,December 2010
PRINCIPLES OF COMMUNICATION
Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Prove the following convolution laws:
   (a) Commutative law,
   (b) Associative Law, and
   (c) Distributive law. [5+6+5]

2. The spectral range of a function extends from 10.0 MHz. Find the minimum sampling rate, the maximum sampling time. [16]

3. The rms voltage of a carrier wave is 5 volts before modulation and 5.9 volts after modulation. What is the percentage of modulation? Calculate the modulated power if the unmodulated power is 2kw. [16]

4. (a) An analog signal having 4-KHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.
      i. What is the information rate of this source?
      ii. Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 KHz and an SNR ratio of 20 dB?
      iii. Find the S/N ratio required for error-free transmission for part (b).
      iv. Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 20 dB.
   (b) Define source coding and give two examples. [12+4]

5. Show that the probability of error in a ASK system is greater than that for a PSK system for transmitting the same amount of signal energy. [16]

6. (a) Show that the nonzero code polynomial of minimum degree in a cyclic code C is unique.
   (b) Find a generator polynomial g(x)for a (7, 4) cyclic code
   (c) Consider a (7, 4) cyclic code with g(x) = 1+x+x^3.
      i. Let data word d=(1010). Find the corresponding code word.
      ii. Let the code word c=(1100101). Find the corresponding data word.
   [5+5+6]

7. (a) Obtain an expression for the quantization noise in a A-law companded PCM system.

   (b) Explain what type of signals need to be companded? [10+6]

8. A carrier voltage 10 cos $8\pi 10^6$t is angle modulated by a modulating signal 5 cos $30\pi.10^3$t. Determine the bandwidth for frequency modulation assuming $k_f = 15$ kHz per volt. [16]

⋆⋆⋆⋆⋆

Code No: 07A6EC12 **R07** **Set No. 4**

III B.Tech II Semester Examinations,December 2010
PRINCIPLES OF COMMUNICATION
Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering

Time: 3 hours Max Marks: 80

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

1. (a) Describe about Convolutional Codes with an example.
   (b) A convolutional encoder has a rate r=1/2, constraint length K = 2. The code is systematic. Find the encoder output produced by the message sequence 10111. Shown in figure 1 [8+8]

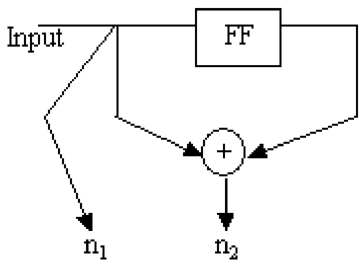

Figure 1

2. State and prove the sampling theorem (frequency domain). [16]

3. What is meant by pre-emphasis and de-emphasis in FM? give the importance and application of these methods. [16]

4. An AM transmitter has an unmodulated carrier power of 10kw. It can be modulated by a sinusoidal modulating voltage to a maximum depth of 40%, without overloading. If the maximum modulation index is reduced to 30% what is the extent up to which the unmodulated carrier power can be increased to avoid overloading? [16]

5. (a) Derive an expression for the probability of bit error for coherent ASK.
   (b) A binary data transmission system of equally likely bits transmits signals Si(t) as + A volts or - A volts for '0' and '1' respectively. The bit period is set to T = 1. the channel presents AWGN noise of zero mean and power spectral density equal to 0.5.
      i. Determine the value of A as a function of E, the average energy of the transmitted signal S(t)
      ii. If the threshold in the comparator is set to 0.1, what will be the associated probability of a bit error? [8+8]

6. (a) Derive any three properties of Autocorrelation R(Γ).

(b) Prove the Auto correlation property R(Γ) = R(-Γ). [8+8]

7. A signal band limited to 1MHz is sampled at a rate of 50% higher than Nyquist rate and quantized into 256 levels using a μ-law quantizer with μ=255.

   (a) Determine the signal to quantization noise ratio.

   (b) The SNR found in (a) was unsatisfactory It must be increased at least by 10dB.Would you be able to obtain the desired SNR without increasing the transmission bandwidth, if it was found that a sampling rate 20% above the Nquist rate is adequate. If so, explain how. What is the maximum SNR that can be realized in this way. [8+8]

8. A DMS X has five symbols x_1, x_2, x_3, x_4 and x_5 with respective probabilities 0.2, 0.15, 0.05, 0.1, and 0.5 construct a shannon-Fano code and a huffman code for X and compare their code efficiancies. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A6EC12 **R07** **Set No. 1**

III B.Tech II Semester Examinations,December 2010
PRINCIPLES OF COMMUNICATION
Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss the following with suitable examples
   i. Hamming codes
   ii. Interlaced codes

   (b) What is meant by Hamming distance (d_{min})? Show that D errors in a received codeword can be detected if D <= $\mathrm{d_{min}}-1$. [10+6]

2. Explain about the modulation and its necessity in communications? [16]

3. Give the importance of sampling theorem in communication. [16]

4. An FM radio link has a frequency deviation of 30 kHz. The modulating frequency is 3 kHz. Calculate the bandwidth needed for the link. What will be the bandwidth if the deviation is reduced to 15 kHz? [16]

5. (a) If a DMS X has five equally likely symbols, Construct a Shannon-Fano code for X, and calculate the efficiency of the code.

   (b) Construct another Shannon-Fano code and compare the results. [7+9]

6. (a) Explain correlation receiver with block diagram. Also explain why the correlation receiver is also called as integrate and Dump filter.

   (b) Distinguish between PSK and FSK. [10+6]

7. For a PCM signal, determine L if the compression parameter $\mu = 100$ and the minimum SNR required is 45 dB. Determine the output SNR with this value of L. Derive the formula used. [16]

8. (a) Find the Fourier transform of a periodic Gate function with period T =1/2 and width $\Gamma = 1/20$?

   (b) State and explain the Hilbert Transform. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A6EC12 **R07** **Set No. 3**

III B.Tech II Semester Examinations,December 2010
PRINCIPLES OF COMMUNICATION
Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. With reference to PCM system, explain the following:
   (a) Quantization error
   (b) companding
   (c) encoder
   (d) decoder. [4+4+4+4]

2. A band pass signal has a spectral range that extends from 20 to 82 kHz. Find the acceptable range of the sampling frequency f_s. [16]

3. (a) Explain
      i. Lossless channel
      ii. Deterministic channel
      iii. Binary Symmetric channel.
   (b) Prove that the channel capacity of a channel of infinite bandwidth with white Gaussian noise is finite. [9+7]

4. (a) Draw QPSK transmitter circuit and explain its operation. What is the band width required for transmission?
   (b) What is the difference between bit rate and baud rate? Derive the relation between the two for QPSK signal. [10+6]

5. The spectral range of a function extends from 10.0 MHz to 10.2 MHz. Find the minimum sampling rate, the maximum sampling rate. [16]

6. Derive the spectrum of wideband angle modulation(WBFM). [16]

7. In a linear collector-modulated amplifier, the amplitude of the modulating voltage is 60 volts, and the collector supply voltage is 150 volts. The dc collector current under an unmodulated condition is 45 amperes. The unmodulated carrier power is 1 kw: calculate
   (a) the modulation index:
   (b) the circuit efficiency:
   (c) the plate dissipation; and
   (d) the modulated carrier power. [4+4+4+4]

8. (a) Construct the standard array for a (6, 3) linear block code whose generator matrix is given below. $G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$

   (b) Write the advantages of table lookup decoding scheme in linear block codes. [10+6]

⋆⋆⋆⋆⋆