Code No: R05220503 **Set No. 1**

II B.Tech II Semester Regular Examinations, Apr/May 2008
PRINCIPLES OF COMMUNICATIONS
(Common to Computer Science & Engineering, Bio-Medical Engineering, Information Technology, Computer Science & Systems Engineering and Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the types of communications? Explain.
   (b) Define noise. Where is it most likely to affect the signal? [8+8]

2. The modulating signal f(t) in an AM-SC system is a multiple-tone signal given by f(t) = $E_1 cos\omega_1 t + E_2 cos\omega_2 t + E_3 cos\omega_3$t the signal f(t) modulates a carrier E_c cosω_ct. Plot the single-sided trigonometric spectrum and, find the bandwidth of the modulated signal. Assume that $\omega_3 > \omega_2 > \omega_1$ and $E_3 > E_2 > E_1$. [16]

3. Explain about the parameter variation method (direct method) for FM generation. [16]

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

5. (a) What are the applications of PCM systems give in detail any two applications?
   (b) Explain why is it necessary to use greater sampling rate for DM than for PCM? [10+6]

6. (a) Sketch the binary ASK, FSK, PSK, and QPSK waveform for the following sequence 1011.
   (b) A received signal is ± 1mv for T_b second intervals with equal probability. The signal is accompanied by white Gaussian noise with a psd of 10^{-10} Watt/Hz. The receiver integrates the signal plus noise synchronously for Tb second duration and decodes the signal by comparing the integrator output with 0. Find the maximum signaling rate (Minimum value of T_b) such that Pe=10^{-4}.[12+4]

7. (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]

8. (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 <= d_{min}−1. [10+6]

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

Answer any FIVE Questions
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1. (a) Explain the functionality of block diagram of electrical communication system.
   (b) The carrier performs certain functions in radio communications. What are they? [8+8]

2. A channel has a uniform noise power density spectrum $S_n(\omega) = 0.25 \times 10^{-3}$. A DSB-SC signal with carrier frequency of 200 kHz is transmitted over this channel. The modulating signal f(t) is band limited to 10 kHz. The power of the sideband signal is 5 kw. The incoming signal at the receiver is filtered through an ideal bandpass filter before it is fed to the demodulator.
   (a) What is the transfer function of this filter at the receiver?
   (b) Find the S/N ratio at the demodulator input and output.
   (c) Find and sketch the noise power density spectrum at the demodulator output. [6+6+4]

3. Show that the first order PLL a negative slope θ(t) causes unstable operating point. [16]

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

5. (a) What do you understand by PCM? How quantizing and coding are done?
   (b) What is aliasing effect and aperture effect. How these effects can be overcome. [8+8]

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. (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]

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

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

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Code No: R05220503 **Set No. 3**

II B.Tech II Semester Regular Examinations, Apr/May 2008
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find the Fourier Transform of Trapezoidal function x(t).
   (b) Find the Energy of the signal $X(t) = 2A\omega Sinc(2\omega t)$. [8+8]

2. An amplitude-modulated amplifier provides an output of 106 watts at 100% modulation. The internal loss is 20 watts.
   (a) What is the unmodulated carrier power?
   (b) What is the sideband power? [8+8]

3. Show that an increase in the carrier amplitude A in FM has a noise-quenching affect. [16]

4. 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]

5. (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]

6. Draw the block diagram of QPSK transmitter and receiver and explain the operation. [16]

7. (a) Define information, entropy, channel capacity and data Rate.
   (b) Derive the expression for the channel capacity of a binary symmetric channel. [8+8]

8. (a) What do you understand by error control coding? Explain the various methods briefly.
   (b) What are cyclic codes? Explain the algebraic structure of cyclic codes. [8+8]

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Code No: R05220503 **Set No. 4**

II B.Tech II Semester Regular Examinations, Apr/May 2008
PRINCIPLES OF COMMUNICATIONS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the functionality of block diagram of electrical communication system.
   (b) The carrier performs certain functions in radio communications. What are they? [8+8]
2. Show that the figure of merit γ for an AM system using synchronous detection is identical to the envelope detector. [16]
3. Explain about the effect of the modulation index β on bandwidth. [16]
4. Explain how PPM signals are generated from PAM signals. [16]
5. (a) Describe different types of signaling formats with neat sketches.
   (b) Explain the features of Flat top Sampling and Aperture effect. [8+8]
6. (a) Draw the block diagram of non coherent receiver for the detection of binary FSK signals and explain.
   (b) Derive an expression for probability of error for coherent FSK. [8+8]
7. (a) Define information, entropy, channel capacity and data Rate.
   (b) Derive the expression for the channel capacity of a binary symmetric channel. [8+8]
8. (a) What do you understand by error control coding? Explain the various methods briefly.
   (b) What are cyclic codes? Explain the algebraic structure of cyclic codes. [8+8]

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