

First Semester M.Tech. Degree Examination, January 2011

Advanced Digital Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

1.
 - a. Explain the two dimensional parity checks. (04 Marks)
 - b. Explain block oriented information and stream oriented information, with examples. (06 Marks)
 - c. Let $g(x) = x^3 + x + 1$. Consider the information sequence 1001.
 - i) Find the codeword corresponding to the preceding information sequence.
 - ii) Suppose that the codeword has a transmission error in the first bit. What does the receiver obtain when it does its error checking? (10 Marks)
2.
 - a. Explain the steps involved in the digital transmission of an analog signal. (10 Marks)
 - b. Suppose a signal has amplitudes uniformly distributed between $-V$ and V .
 - i) What is the SNR of a uniform quantizer that is specifically designed for this source?
 - ii) If the error takes on values between $-\Delta/2$ and $\Delta/2$, show that the average power of error is given by $\Delta^2/12$, and hence show that, each additional bit, used in the quantizer, will increase the SNR by 6 dB. (10 Marks)
3.
 - a. Suppose that a lowpass communication system has 1 MHz bandwidth. What bit rate is attainable using 8 level pulses? What is the Shannon capacity of this channel, if the SNR is 40 dB? (04 Marks)
 - b. A voice grade channel of the telephone network has a bandwidth of 3.4 kHz.
 - i) Calculate the channel capacity of the telephone channel for a signal to noise ratio of 30 dB.
 - ii) Calculate the minimum signal to noise ratio required to support information transmission through the telephone channel at the rate of 4800 bits/second. (06 Marks)
 - c. Discuss the discrete memoryless channels. (10 Marks)
4.
 - a. Define binary symmetric channel. Draw the transition probability diagram of a binary symmetric channel. (05 Marks)
 - b. Discuss the properties of mutual information. (06 Marks)
 - c. Define the terms : i) Entropy ii) Conditional entropy iii) White noise. (09 Marks)
5.
 - a. Explain the basic signal processing operations involved in PCM. (06 Marks)
 - b. A subband coding scheme involves a total of 7 subbands. The sampling rate for the full-band input signal is 8 kHz and the average number of bits, used to encode a sample of the input is 2. Calculate : i) The sampling rate for each subband. ii) The total number of bits per sample for the group of 7 subbands. (04 Marks)
 - c. Explain DPCM. (10 Marks)
6.
 - a. Show that under the assumption of no slope-overland distortion, the maximum output signal-to-noise ratio of a delta modulator, is proportional to the sampling rate cubed. (10 Marks)
 - b. Explain how the performance of a PCM system is influenced by noise. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 4.2+6 = 50, will be treated as malpractice.

- 7 a. The binary data 001101001 is applied to the input of a duobinary system :
- Construct the duobinary coder output and corresponding receiver output with a precoder.
 - Suppose due to error during transmission, the level at the receiver input produced by the second digit is reduced to zero. Construct the new receiver output. (08 Marks)
- b. What is correlative coding? Explain the duobinary signaling, with precoding and without precoding. (12 Marks)
- 8 Explain the following :
- Intersymbol interference (05 Marks)
 - Eye pattern (05 Marks)
 - Nyquist criterion for distortionless baseband transmission. (10 Marks)
