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First Semester M.Tech. Degree Examination, February 2013
Advanced Digital Communication

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1
 - a. Mention the advantages of digital transmission as compared to analog transmission. (04 Marks)
 - b. State Nyquist's sampling theorem and explain its significance in digital communications. (04 Marks)
 - c. Determine the channel capacity of a 2.4 kHz telephone line with 20 dB SNR. (06 Marks)
 - d. A 10 kHz baseband signal is used by a digital transmission system. Ideal pulses are sent at Nyquist rate and pulse can take M levels. What is the bit rate of the system for M = 16, M = 32 and M = 64?

- 2
 - a. With illustrations, differentiate between ASK, FSK and PSK. (06 Marks)
 - b. For the sequence 0110101001, draw the waveforms using NRZ-inverted, bipolar, Manchester and differential Manchester encoding techniques. (08 Marks)
 - c. Describe the frequency domain characteristics of communication channels. (06 Marks)

- 3
 - a. Explain the modulation and demodulation procedure using QAM. (06 Marks)
 - b. Calculate the bandwidth of the range of light covering the range from 1200nm to 1400nm. Repeat for 1400nm to 1600nm range. The speed of light in fiber is approximately 2×10^8 m/s. (04 Marks)
 - c. Explain the characteristics of coaxial media and optical fiber media with neat sketches and atleast one application each. Also indicate their standards. (10 Marks)

- 4
 - a. Describe how internet checksum is used to detect errors in digital communications. (04 Marks)
 - b. An early code used in radio communications involved using code words that consist of binary bits and contain the same number of 1's. Thus the 2-out-of-5 code only transmits blocks of 5 bits in which 2 bits are 1 and the others are 0's. List the valid codewords. Suppose this code is used to transmit blocks of binary bits, how many bits can be transmitted per codeword? Find the probability of error-detection failure for the code for random error vector channel and random bit error channel. (08 Marks)
 - c. Let $g_1(x) = x + 1$ and $g_2(x) = x^3 + x^2 + 1$. The information polynomial $i(x) = 110110$. Find codeword for $i(x)$, if $g_1(x)$ and $g_2(x)$ are used individually as generator polynomials. Also find codeword when $g(x) = g_1(x), g_2(x)$ is used as generator polynomial. Comment on the error-detecting capabilities of each result. (08 Marks)

- 5
 - a. With a block diagram, explain the basic elements of a digital communication system. (10 Marks)
 - b. Describe the discrete memoryless channel model and discuss about the channel capacity achievable for such a channel. (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. $42+8=50$, will be treated as malpractice.

- 6 a. Explain the delta modulation system. How does quantization noise affect such a system? What can be done to improve its performance? Explain. (10 Marks)
- b. Describe the application of digital multiplexers for combining digitized voice and video signals with digital data. (10 Marks)
- 7 a. What is inter symbol interference? Explain how it affects the binary baseband data transmission system. (08 Marks)
- b. Describe correlative coding and its generalized scheme. (12 Marks)
- 8 a. Write an explanatory note on eye patterns and mention its interpretation. (10 Marks)
- b. Explain how adaptive equalization is used to efficiently transmit digital data at high speeds. (10 Marks)

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