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06EC61

Sixth Semester B.E. Degree Examination, May/June 2010
Digital Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a block diagram, explain the basic signal processing operations involved in a digital communication system. **(07 Marks)**

b. Explain 'flat-top' sampling, using waveforms and equations. **(07 Marks)**

c. The signal $x(t) = 2\cos 400\pi t + 6\cos 640\pi t$ is ideally sampled at $f_s = 500$ Hz. If the sampled signal is passed through an ideal low pass filter with cut off frequency of 400 Hz:
i) Determine the spectrum of the sampled signal and sketch.
ii) What frequency components will appear in the filter output? **(06 Marks)**

2 a. Write a note on 'TDM'. **(04 Marks)**

b. Show that the signal to quantization noise power ratio of a uniform quantizer is $[SNR]_{dB} = 1.8 + 6n$ and n = number of bits/sample. **(06 Marks)**

c. What is the necessity of non uniform quantization? Explain compounding. **(06 Marks)**

d. A telephone signal band limited to 4 KHz is to be transmitted by PCM. The signal to quantization noise power ratio is to be at least 40 dB. Find the number of levels into which the signal has to be encoded. Also find the transmission band width. **(04 Marks)**

3 a. With neat diagrams, explain the operation of DPCM. **(07 Marks)**

b. A DM system is tested with a 10 KHz sinusoidal signal with 1 V peak to peak at the i/p. It is sampled at 10 times the Nyquist rate. What is the step size required to prevent slope overload? **(04 Marks)**

c. Explain T1 – carrier system. **(05 Marks)**

d. For the binary bit sequence 10110100, draw the waveforms using: **(04 Marks)**
i) Unipolar NRZ ii) Unipolar RZ iii) Polar NRZ iv) Bipolar NRZ.

4 a. Describe Nyquist's criteria for distortionless baseband transmission. **(06 Marks)**

b. Explain the need for a precoder in a duobinary signaling. For i/p binary data 1011101, obtain the o/p precoder and o/p of duobinary coder. Explain how data can be detected at the receiver. **(08 Marks)**

c. What is equalization? Explain adaptive equalization for data transmission. **(06 Marks)**

PART – B

5 a. Explain the working of:
i) Coherent BFSK transmitter and ii) QPSK transmitter. **(10 Marks)**

b. The bit stream 1011100011 is to be transmitted using DPSK technique. Determine the encoded sequence and transmitted phase sequence. Also write the block diagram of the modulator and demodulator for the same and explain. **(10 Marks)**

6 a. A binary data is transmitted using ASK over a AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1 μV. Noise spectral density $N_o/2$ is 10^{-15} Watt/Hz. Find the average probability of error if the detection is coherent. Take $\in rfc(5) \simeq 3\times10^{-6}$. **(06 Marks)**

b. With a diagram, explain the model of digital communication system. **(08 Marks)**

c. Explain geometric interpretation of signals. **(06 Marks)**

7 a. Explain the detection of known signals in noise. **(10 Marks)**

b. Write a note on minimum mean square error estimate. **(04 Marks)**

c. A polar NRZ waveform is to be received by a matched filter. Binary 1 is represented by a rectangular positive pulse and binary 0 is represented by a rectangular negative pulse. Find out the impulse response of the matched filter and sketch it. **(06 Marks)**

8 a. Mention the applications of spread spectrum system. Explain the principle of direct sequence spread spectrum system. **(08 Marks)**

b. Explain the frequency hopped spread spectrum system. **(08 Marks)**

c. A slow FH/MFSK system has the following parameters:
The number of bits / MFSK symbol = 04
The number of MFSK symbol / hop = 05
Calculate the processing gain of the system in decibels. **(04 Marks)**

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