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10EC/TE61

Sixth Semester B.E. Degree Examination, June/July 2019

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. Compare analog and digital communication. **(04 Marks)**

b. Derive the interpolation formula for reconstructing the original signal from the sequence of sampled values. **(08 Marks)**

c. The signal $x(t) = 12\cos(800\pi t)\cos^2 1800\pi t$ is ideally sampled at 4600 samples/sec. What is the minimum allowable sampling frequency? What is the range of the cut-off frequency for the lowpass filter? Draw the frequency components present in the output of the lowpass filter. **(08 Marks)**

2 a. Derive an expression for output SNR of the quantizer and show that $(SNR)_0 = 1.76 + 6n$ in db if a sinusoidal signal is quantized. **(08 Marks)**

b. What is the need for non-uniform quantization? Explain μ-law and A-law compounding. **(08 Marks)**

c. A PCM system uses a uniform quantizer followed by a 7 bit binary encoder. The bit rate of the system is equal to 50×10^6 bits/sec:

i) What is the sampling frequency?

ii) Calculate the $(SNR)_0$. **(04 Marks)**

3 a. What is slope overload distortion and granular noise in delta modulation and how can it be reduced? **(08 Marks)**

b. Obtain the expression for power spectral density of NRZ unipolar format. **(06 Marks)**

c. Explain T1 carrier system. **(06 Marks)**

4 a. Explain ISI. Derive an expression for Nyquist pulse shaping criterion for distortionless baseband binary transmission. **(08 Marks)**

b. Explain eye pattern. **(06 Marks)**

c. A continuous time signal is connected into a PCM wave. The number of quantization levels = 64. A synchronizing pulse is added at the end of each code word representing a sample of the analog signal. The resulting PCM is sent over a channel of bandwidth 24 kHz using a binary PAM system with raised cosine spectrum with roll of = 1.

i) Find the bit rate

ii) Find the sampling rate

iii) What is the highest frequency of the continuous time signal? **(06 Marks)**

PART – B

5 a. With a block diagram, explain coherent QPSK transmitter and receiver. **(08 Marks)**

b. Explain non-coherent DPSK system. **(06 Marks)**

c. For a given binary sequence 01101000 sketch the inphase and quadrature phase components of QPSK. Adding these two get the final waveform. **(06 Marks)**

6 a. Explain the two stage Gram-Schmidt orthogonalization procedure to find the orthonormal functions. **(10 Marks)**

b. Derive the equation for maximum likelihood estimation. **(10 Marks)**

7 a. List the properties of a matched filter receiver. **(08 Marks)**

b. Show that the probability of bit error of a matched filler receiver is given by $P_e = \frac{1}{2}\text{erfc}\sqrt{\frac{E_b}{N_o}}$. **(08 Marks)**

c. Let s(t) be a rectangular pulse of amplitude A and duration T seconds, applied to the input of a filter matched to s(t). Determine the output signal to noise ratio of the filter at t = T in terms of noise power spectral density. **(04 Marks)**

8 a. What is spread spectrum? Explain the principle of direct sequence spread spectrum system. **(08 Marks)**

b. Explain the properties of PN sequence. **(06 Marks)**

c. In a DSSS it is required to have a jamming margin greater than 26 dB. The ratio E_b/N_o is set at 10. Determine the minimum processing gain and the minimum number of stages required to generate the maximum length of sequence. **(06 Marks)**

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