2002 SCHEME

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EC61

Sixth Semester B.E. Degree Examination, June 2012
Digital Communication

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions***
2. Use of error function tables permitted.

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.

1 a. Show that the flat–top sampled signal s(t) is equivalent to the convolution of ideally sampled signal and the sampling function h(t) used for the flat–top sampling. **(08 Marks)**

b. Consider the signal $x(t) = 4 \cos 30 \pi t$

i) If the signal is sampled by impulse train, sketch its spectrum for the sampling rates :
35 samples per sec and
15 samples per sec

ii) Suppose each of the sampled signals of part i) is passed through a lowpass reconstruction filter with cutoff of 32 H3. Find the output in each case. In cases where there is aliasing, indicate which terms are aliases and which are desired components. **(12 Marks)**

2 a. Show that $H(f) = T \sin c(fT)\, e^{-j2\pi fT}$, for the sampling function h(t), used for flat – top sampling. **(06 Marks)**

b. Explain the quadrature sampling of bandpass signals. **(10 Marks)**

c. A delta modulation system uses 3 times the Nyquist rate for a signal with 3 KHz bandwidth. The quantizing stepsize is 250 mV. Determine the SNR for 1 KHz sinusoidal input. **(04 Marks)**

3 a. With a neat block diagram, explain DM transmitter and receiver operation. Sketch the waveform for $m_q(nTs)$ and give the relation between f_s and bit rate R_b. **(12 Marks)**

b. Explain the need for nonuniform quantization. Explain how it is achieved. **(08 Marks)**

4 a. Derive the mathematical equation to explain ISI. **(06 Marks)**

b. Define correlative coding. Mention the differences between duobinary and modified duobinary coding. **(08 Marks)**

c. A computer putsout binary data at the rate of 56 kilobits per second. The computer output is transmitted using a baseband binary PAM system that is designed to have a raised cosine pulse spectrum. Determine the transmission bandwidth for each of the following roll off factors :
i) $\alpha = 0.25$; ii) $\alpha = 0.5$; iii) $\alpha = 0.75$. **(06 Marks)**

5 a. Derive expression for probability of bit error for binary ask system. **(10 Marks)**

b. Show that correlator output in a correlation receiver and matched filter output in a matched filter receiver are equivalent. **(04 Marks)**

c. An FSK system transmits binary data at a rate of 10^6 bits per second. Assuming channel noise is additive white Gaussian with zero mean and power spectral density 2×10^{-20} watts/ Hz, determine the average probability of error. Assume coherent detection and 1.2 microvolt of amplitude for received signal for both symbol 1 and 0. **(06 Marks)**

6 a. Explain the coherent and noncoherent schemes for FSK detection. **(08 Marks)**

b. Using Gram–Schmidt orthogonalization procedure,

i) Find a set of orthogonal basis functions to represent the signals $S_1(t)$ and $S_2(t)$ shown in Fig. Q6(b). The symbol interval is $0 \le t \le T$ sec.

ii) Mention the dimension of the signal space

iii) Sketch the basis functions

iv) Express $S_1(t)$ and $S_2(t)$ in terms of basis functions. **(12 Marks)**

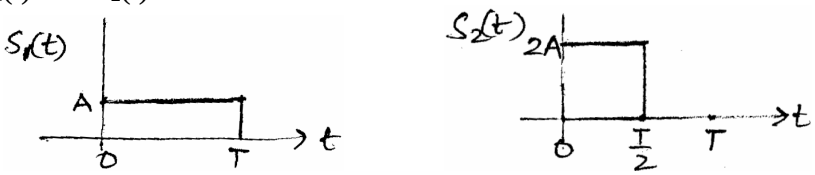

Fig. Q6(b)

7 a. Explain the signal processing steps of signal demodulator using a correlator and signal detection, incase of a correlation receiver. **(10 Marks)**

b. Explain the direct sequence spread spectrum system, using neat block diagrams for transmitter and receiver. **(10 Marks)**

8 Write short notes on :

a. T1 system

b. Adaptive equalization

c. Subband coding

d. Eye pattern. **(20 Marks)**

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