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06EC61

Sixth Semester B.E. Degree Examination, June 2012

Digital Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat block diagram, explain the operations of digital communication system. Explain the functioning of each block. **(06 Marks)**

b. A signal $g(t) = 10 \cos(20\pi t) \cos(200\pi t)$ is sampled at the rate of 250 samples/sec.
   i) Sketch the spectrum of the sampled signal
   ii) Specify the cut-off ideal reconstruction filter so as to recover g(t) from $g_s(t)$
   iii) Specify the Nyquist rate for the signal g(t). **(08 Marks)**

c. What is flat-top sampling? Derive an expression for the flat-top sampled signal. **(06 Marks)**

2 a. Show that the signal to quantization noise power ratio of a uniform quantizer is $\frac{P}{\sigma_Q^2} = \left[\frac{3P}{g_{max}^2}\right] 2^{2n}$. **(08 Marks)**

b. For a binary PCM signal, determine L if the compression parameter $\mu = 100$ and the minimum $[SNR]_{0, dB} = 45$ dB. Determine the $[SNR]_{0, dB}$ with this value of L. **(06 Marks)**

c. With a neat block diagram and waveform, explain time division multiplexing. **(06 Marks)**

3 a. With a neat block diagram, explain delta modulator transmitter and receiver, and also explain the errors in delta modulation. **(08 Marks)**

b. Obtain the power spectral density of NRZ polar format and draw normalized diagram. **(08 Marks)**

c. Compare DM with DPCM. **(04 Marks)**

4 a. Derive the Nyquist criterion for distortionless baseband binary transmission. **(08 Marks)**

b. What is eye pattern? Explain in detail. **(06 Marks)**

c. With a neat filter structure, explain the concept of adaptive equalization process. **(06 Marks)**

PART – B

5 a. List the important requirements of passband transmission scheme. **(04 Marks)**

b. Estimate the power spectral density of a BPSK signal from Fourier transform of basic NRZ pulse. **(12 Marks)**

c. What are the advantages of MSK over QPSK? **(04 Marks)**

6 a. Explain geometric interpretation of signals. **(08 Marks)**

b. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are shown in Fig.Q6(b). Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signals. Express signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis functions. Also give the signal constellation diagram. **(12 Marks)**

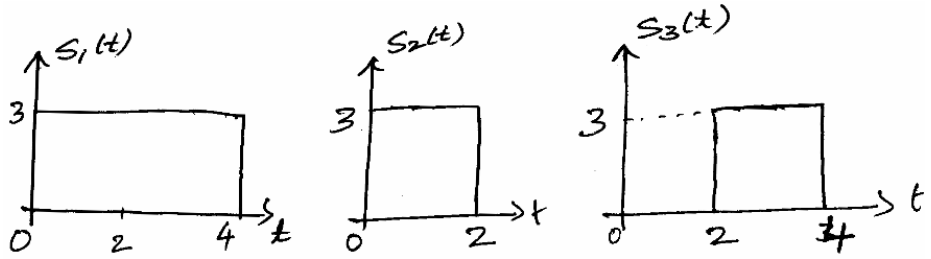

Fig.Q6(b)

7 a. Show that the probability of bit error of a matched filter receiver is given by:

$$P_e = \frac{1}{2}\text{erfc}\sqrt{\frac{E_b}{N_o}}.$$ **(12 Marks)**

b. Draw and explain the block diagram of correlation receiver. **(08 Marks)**

8 a. What is spread spectrum technique? Explain the working of direct sequence spread spectrum transmitter and receiver. **(10 Marks)**

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

c. Compare slow and fast frequency Hopping. **(04 Marks)**

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