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10EC/TE61

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016
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 neat sketches explain flat top sampling. **(07 Marks)**

b. What is Aperture effect? Explain how it can be compensated. **(05 Marks)**

c. A signal $g(t) = 10\cos(20\pi t)\cos(200\pi t)$ is sampled at the rate of 250 samples/sec.
i) Sketch spectrum of sampled signal.
ii) Specify the cutoff of ideal reconstruction filter so as to recover g(t) from $g_\delta(t)$. **(08 Marks)**

2 a. Explain the block diagram of regenerative repeater. **(05 Marks)**

b. A PCM system uses a uniform quantizer followed by a v bit encoder. Show that rms signal to quantization noise ratio is approximately given by $(1.8 + 6v)$ db. **(06 Marks)**

c. With neat sketch explain companding in PCM. Also explain μ-law and A-law companding. **(09 Marks)**

3 a. Explain the following with neat sketch:
i) Slope overload distortion.
ii) Granular noise. **(05 Marks)**

b. A delta modulator is designed to operate at five times the Nyquist rate for a signal with 3 kHz bandwidth. Determine the maximum amplitude of a 2 kHz I/P sinusoid for which delta modulator does not have slope overload. Quantizing step size is 250 mV. **(05 Marks)**

c. For the binary bit stream 10011011 draw the waveforms for the following cases:
i) Polar NRZ ii) Manchester RZ iii) Gray code NRZ **(05 Marks)**

d. With neat sketch explain power spectra of discrete PAM signals. **(05 Marks)**

4 a. What is ISI? Derive an expression for Nyquist pulse shaping criterion for distortionless base band binary transmission. **(06 Marks)**

b. What is correlative coding? Explain duobinary coding with and without precoding. **(06 Marks)**

c. The binary data 011100101 are applied to the I/P of a modified duo binary system.
i) Construct modified duo binary coder O/P without precoder.
ii) Suppose that due to error in transmission, the level produced by the third digit is reduced to zero. Construct a new receiver output. **(08 Marks)**

PART – B

5 a. With neat block diagram, explain the DPSK transmitter and receiver. **(08 Marks)**

b. Obtain the expression for probability of symbol error of coherent binary FSK. **(07 Marks)**

c. Binary data are transmitted over a microwave link at the rate of 10^6 bps and the PSD of the noise at the receiver input is 10^{-10} W/Hz. Find the average carrier power required to maintain an average prob. of error $P_e \leq 10^{-4}$ for coherent binary FSK. What is the required channel B.W? (Take erfc (3.71) = 10^{-4}) **(05 Marks)**

6 a. Explain the Gram Schmidt orthogonalization procedure to obtain the orthonormal basis function for linearly independent set of signals. **(12 Marks)**

b. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are as shown in Fig. Q6 (b). Apply Gram Schmidt procedure to obtain an orthonormal basis for the signals. Express the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis functions. Also give signal constellation diagram. **(08 Marks)**

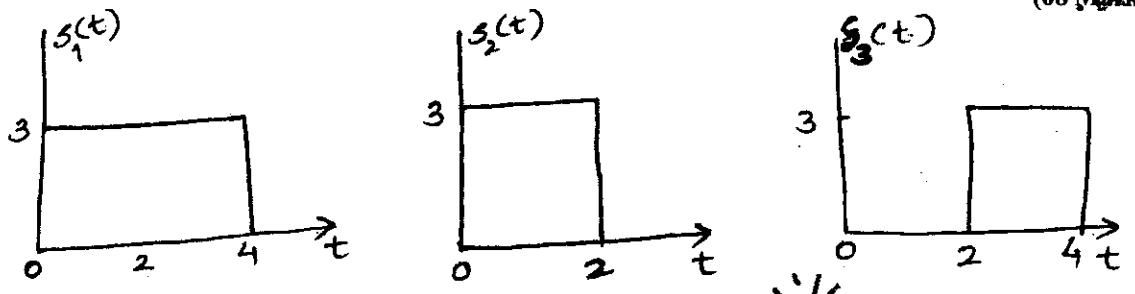

Fig. Q6 (b)

7 a. Show that the output SNR of a matched filter is proportional to ratio of signal energy to PSD of input noise. **(06 Marks)**

b. Explain the function of correlation receiver. **(06 Marks)**

c. Determine the impulse response of matched filter. **(08 Marks)**

8 a. Explain properties of PN sequence (max length sequence). **(06 Marks)**

b. Explain the working of direct sequence spread spectrum transmitter and receiver with BPSK. **(08 Marks)**

c. The direct sequence spread spectrum communication system has following parameters:
Data sequence bit duration $T_b = 4.095$ ms, PN chip duration $T_C = 1$ μs.
$\frac{E_b}{N_0} = 10$ for average probability of error less than 10^{-5}.
Calculate processing gain and jamming margin. Also find jamming margin in db. **(06 Marks)**

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