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10EC/TE61

Sixth Semester B.E. Degree Examination, July/August 2022
Digital Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the basic signal processing operations in Digital communications with block diagram. **(06 Marks)**

b. Explain the operation of quadrature sampling band-pass signals with generation of in-phase and quadrative samples from band-pass signal g(t) and Reconstruction of band-pass signal g(t). **(08 Marks)**

c. Find the Nyquist rate and Nyquist interval for the signal

$x(t) = \frac{1}{2\pi} \text{Cos}\,(4000\,\pi t)\,\text{Cos}\,(1000\,\pi t)$. **(06 Marks)**

2 a. Explain the operation of Time division multiplexing system with block diagram and waveforms illustrating TDM for two message signals. **(10 Marks)**

b. A signal $m_1(t)$ is band limited to 3KHz and three other signals $m_2(t)$, $m_3(t)$ and $m_4(t)$ are band limited to 1.5KHz each. These are transmitted by means of TDM.

i) Setup a commutator scheme to realize the multiplexing with each signal sampled at Nyquist rate.

ii) Find the speed of the commutator in samples/sec and the maximum band-width of the channel **(06 Marks)**

c. What is the significance of robust quantization? Explain briefly. **(04 Marks)**

3 a. Explain the operation of the differential pulse-code modulation with transmitter scheme and Receiver scheme. **(08 Marks)**

b. With block diagram approach, explain the operation of the delta modulator system. **(06 Marks)**

c. A Delta modulator system is designed to operate at three times nyquist rate for a signal with 3KHz bandwidth. The quantizing step-size is 250mV.

i) Determine the maximum amplitude of a 1KHz I/P Sinusoid for which DM system does not show slope overload.

ii) Determine the post filtered output signal to noise ratio for the signal of part i) **(06 Marks)**

4 a. Explain the Intersymbol Interference effect with block diagram approach using baseband binary data transmission system. **(07 Marks)**

b. Explain the correlative coding with Duobinary signaling scheme. Plot the frequency response of duobinary conversion filter. **(06 Marks)**

c. Explain the significance of the Eye-pattern with distorted binary wave and Interpretation of eye pattern. **(07 Marks)**

PART – B

5 a. Explain the coherent binary FSK system with signal space diagram binary FSK transmitter and coherent binary FSK receiver. **(10 Marks)**

b. A binary ASK system transmits data at a rate of 4.8 mbps over an AWGN channel having bandwidth 10MHz. The noise is zero mean with power spectral density 10^{-15}W/Hz. The amplitude and received signal is one mV. Determine the average probability of error for coherent ASK detector. **(05 Marks)**

c. Write a note on Differential phase-shift keying. **(05 Marks)**

6 a. Explain the Gram – Schmidt orthogonalization procedure with scheme for generating the signal Si(t) and scheme for generating the set of coefficients {Si}. Write the relevant mathematical expressions. **(10 Marks)**

b. With block diagram approach, explain the conceptualized model of a digital communication system. Write the relevant mathematical expressions. **(10 Marks)**

7 a. Briefly explain about detection of known signal in noise. **(06 Marks)**

b. Explain the operation of the correlation receiver with detector scheme and vector receiver. **(07 Marks)**

c. Explain the operation of the matched filter with relevant diagram and mathematical expressions. **(07 Marks)**

8 a. What are the advantages of spread spectrum system? Mention the applications of spread spectrum modulation. **(06 Marks)**

b. Explain the operation of the Direct sequence spread coherent binary phase shift keying with transmitter scheme and Receiver scheme. **(08 Marks)**

c. In a Direct sequence spread spectrum modulation, it is required to have a jamming margin greater than 26dB. The ratio Eb/No is set at 10. Determine the minimum processing gain and the minimum number of stages required to generate the maximum length sequence. **(06 Marks)**

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