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10EC/TE61

Sixth Semester B.E. Degree Examination, July/August 2021
Digital Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. State the Sampling theorem. Show that the spectrum of a sampling signal

$G_\delta(f) = f_s \sum_{n=-\infty}^{\infty} G(f - mfs)$. **(07 Marks)**

b. Explain the sampling process with appropriate diagrams and equations which is similar to the variation in transmission with frequency that is caused by the finite size of the scanning aperture in television. **(07 Marks)**

c. A bandpass signal g(t) with a spectrum shown below Fig Q1(c) is ideally sampled. Sketch the spectrum of sampled signals at f_s = 25Hz and 45Hz. Indicate if and how the signal can be recovered.

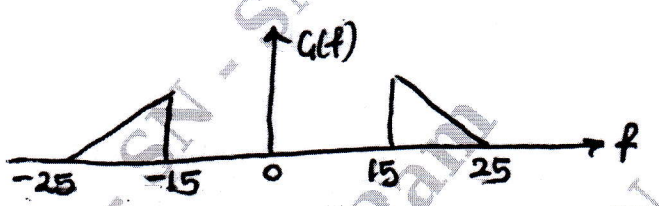

Fig Q1(c) **(06 Marks)**

2 a. Derive the output signal to quantization noise ratio of uniform quantizer whose probability of overload is less than 10^{-4}. **(07 Marks)**

b. What do you mean by "REGENERATION" in PCM system? With a neat block diagram, explain the three basic functions involved in REGENERATION. **(07 Marks)**

c. 6 independent message sources of bandwidth w, w, 2w, 2w, 3w and 3w Hz are to be transmitted on a TDM basis using a common communication channel.

i) Set up a scheme for accomplishing this multiplexing requirement with each message signal sampled at its nyquist rate

ii) Determine the minimum transmission bandwidth of the channel. **(06 Marks)**

3 a. With a neat block diagram, explain delta modulation transmitter and receiver and also explain the errors in delta modulation. **(07 Marks)**

b. Derive the expression for power spectral density NRZ bipolar format and draw its normalized PSD. **(07 Marks)**

c. The binary data sequence is 111000110101. Sketch the waveform for the following formats.

i) Split phase Manchester

ii) Bipolar NRZ

iii) 8-ary signaling waveforms. **(06 Marks)**

4 a. What is Equalization? Explain adaptive equalization for data transmission. **(07 Marks)**

b. Define Inter Symbol Interference and explain ideal solution for zero ISI. **(07 Marks)**

c. The binary data 011100101 are applied to the input of a modified duobinary system.

i) Construct the modified duobinary coder output and corresponding receiver output without a 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. **(06 Marks)**

5 a. With a neat diagram, explain the QPSK transmitter and receiver. **(07 Marks)**

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

c. A binary sequence 101101 is transmitted over a communication channel using a differential phase shift keying (DPSK). The channel introduces a phase shift of 180°

i) Sketch the transmitted signal using a initial bit of 1

ii) Assume that channel is noise free show that the DPSK detector in the receiver produces the original binary sequence despite 180° phase reversal in the channel. **(06 Marks)**

6 a. Prove the Gram – Schmidt Orthogonalization procedure. **(12 Marks)**

b. Explain Geometric Interpretation of signals. **(08 Marks)**

7 a. With block diagram of a detector and vector receivers, explain the working of a correlation receiver. **(10 Marks)**

b. Derive the expression of SNR for a matched filter. **(10 Marks)**

8 a. What is meant by Frequency-hop Spread Spectrum? Explain Slow –Frequency Hopping. **(08 Marks)**

b. In brief discuss the applications of Spread Spectrum Techniques. **(06 Marks)**

c. Consider the PN sequence 01011100101110. Demonstrate the properties of PN sequence for a sequence generated from 3 stage shift register with linear feedback. **(06 Marks)**

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