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10EC/TE61

Sixth Semester B.E. Degree Examination, June/July 2018

### Digital Communication

Time: 3 hrs.

Max. Marks:100

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

#### PART - A

- 1 a. Discuss in brief advantages and disadvantages of digital communication over analog communication. (08 Marks)
- b. Specify the types of digital communication channels. Compare coaxial cable and optical fiber cable. (06 Marks)
- c. A signal  $g(t) = 10 \cos(20\pi t) \cos(200\pi t)$  is sampled at a rate of 250 samples/sec.
  - i). Sketch spectrum of the sampled signal.
  - ii) Specify cut-off frequency of reconstruction filter.
  - iii) Specify the Nyquist rate. (06 Marks)
- 2 a. Explain the three basic functions of a Regenerative Repeater in a PCM system with a neat block diagram. (06 Marks)
- b. 24 Analog signals, each having a bandwidth of 10 kHz are to be time division multiplexed and transmitted via PAM/AM. A guard band of 5 kHz is required for signal transmission from the PAM samples of each signal:
  - i) Determine the sampling rate for each signal.
  - ii) Transmission Band width. (04 Marks)
- c. What is meant by Robust quantization? Derive the equation for Variance of quantization Error ( $\sigma_Q^2$ ) from the basic principle of Non-uniform quantizer. (10 Marks)
- 3 a. A 10 kHz sinusoid with arc amplitude level of  $\pm 1V$  is to be sampled and quantized by rounding off. How many numbers of bits are required to ensure a quantization SNR of 45 dB? What is the Bit rate of the digital signal? If the sampling Rate is twice the Nyquist Rate. (04 Marks)
- b. With a neat diagram, explain the concept of digital hierarchy in a Multiplexer. (08 Marks)
- c. Consider a binary sequence with the values  $+a$  for symbol 1 and  $-a$  for symbol 0, with  $+a$  and  $-a$  are equiprobable. Determine the power spectral density for NRZ polar format and plot the spectra. (08 Marks)
- 4 a. Explain in brief with a neat diagram the concept of baseband data transmission. (10 Marks)
- b. For the input binary data 1011101, obtain the output pre-coder and output duobinary coder. Explain how data can be detected at the Receiver. (06 Marks)
- c. Explain in brief with a neat diagram adaptive equalization. (04 Marks)

#### PART - B

- 5 a. Explain with a neat diagram working of (i) coherent BPSK (ii) QPSK transmitter. (10 Marks)

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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.

- b. A binary data is transmitted using ASK over AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the Receiver is 1 mv. Noise P.S.D  $\left(\frac{N_0}{2}\right) = 10^{-15}$  Watts/Hz. Find the Average Probability of Error if the detector is coherent,  $\text{Erfc}(5) = 3 \times 10^{-6}$ . (06 Marks)
- c. A binary data stream is encoded using DPSK. Determine the encoded and decoded output for the sequence 101101100. (04 Marks)
- 6 a. Define conceptual model of a digital communication system. (08 Marks)  
b. Prove the Gram-Schmidt orthogonalization procedure. (12 Marks)
- 7 a. State and prove properties of the matched filter. (10 Marks)  
b. Explain with a neat diagram, Correlation Receiver. (10 Marks)
- 8 Write short notes on any FOUR:  
a. Generation of PN sequence with example  
b. DSSS transmitter and receiver  
c. Fast and slow frequency hopping  
d. Applications of spread spectrum  
e. PN sequences and their properties. (20 Marks)

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