USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   **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.   **(06 Marks)**
       iii) Specify the Nyquist rate.

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 (σ_Q^2) from the basic principle of Non-uniform quantizer. **(10 Marks)**

3. a. A 10 kHz sinusoid with arc amplitude level of ±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. **(06 Marks)**
       Explain how data can be detected at the Receiver.   **(04 Marks)**
    c. Explain in brief with a neat diagram adaptive equalization.

PART – B

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

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 $\left(\dfrac{N_0}{2}\right) = 10^{-15}$ Watts/Hz. Find the Average Probability of Error if the detector is coherent, Erfc(5) = 3 × 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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