Sixth Semester B.E. Degree Examination, December 2010
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. State the sampling theorem. Show that the spectrum of a sampling signal

$$G_s(f) = f_s \sum_{n=-\infty}^{\infty} G(f - mf_s).$$ (07 Marks)

   b. Explain the quadrature sampling with related block diagram, spectra and equations.
                     (06 Marks)

   c. With related block diagram, equations and waveforms, explain original signal g(t) recovery
from a flat-top sampled signal, using sample and hold circuit.   (07 Marks)

2 a. What is meant by 'Idle channel noise'? Explain with two memoryless quantizer types.
                     (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 reconstruction
from the PAM samples of each signal.
      i)   Determine the sampling rate for each signal.
      ii)   Find the transmission bandwidth.
      iii)   Draw the functional diagram of the transmitter and receiver of TDM signal.
                     (06 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.   (08 Marks)

3 a. What are the types of quantization noises, which occur in delta modulation? Explain with a
neat sketch and equations.   (07 Marks)

   b. Draw the digital data format for a given sequence 0 1 1 0 1 1 0 0 0 1 corresponding to
i) Bipolar RZ   ii) Manchester   iii) Polar quaternary (natural code).   (07 Marks)

   c. Obtain the power spectral density of NRZ polar format.   (06 Marks)

4 a. Explain modified duobinary technique, with a block diagram along with frequency and
impulse response sketches.   (09 Marks)

   b. What is meant by 'eye pattern' in the data transmission system? Explain.   (07 Marks)

   c. Write a note on adaptive equalization.   (04 Marks)

PART – B

5 a. With a block diagram concept, explain the coherent binary FSK – transmitter and receiver.
                     (08 Marks)

   b. For a given input binary sequence 0 1 1 0 1 0 0 0 , sketch the inphase and quadrature phase
components of QPSK. Then by adding these two waveforms, draw the final QPSK
waveform.   (06 Marks)

   c. Explain the non-coherent DPSK system.   (06 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 the three properties of matched filter.   (12 Marks)
    b.   With a neat block diagram, explain the quadrature receiver, using correlators.   (08 Marks)

8   Write short notes on:
    a.   Pseudo noise (PN) sequence
    b.   Frequency hopping
    c.   Spread binary PSK system
    d.   Applications of spread spectrum.   (20 Marks)

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