

Total No. of Questions : 8]

SEAT No. :

P2575

[Total No. of Pages :2

[5153]-551

T.E. (E & TC Engg.)

DIGITAL COMMUNICATION

(2012 Pattern) (End Sem) (Semester-I)

Time : 3 Hours]

[Max. Marks :70

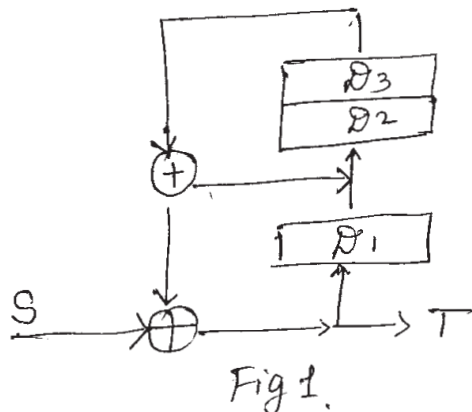
Instructions to the candidates:

- 1) Solve Q1 OR Q2, Q3 OR Q4, Q5, OR Q6, Q7 OR Q8.
- 2) Assume suitable data if necessary.
- 3) Neat diagrams must be drawn wherever necessary.

- Q1) a) Derive the expression for quantization error and signal to quantization noise ratio for a non-sinusoidal PCM system. [6]
- b) Draw AT and T hierarchy multiplexing system and explain. [8]
- c) Explain narrowband noise and represent a narrowband noise in terms of inphase and quadrature components. [6]

OR

- Q2) a) A delta modulator system is designed to operate 5 times the Nyquist rate for a signal with 3KHz bandwidth. Determine the maximum amplitude of 1.2KHz input sinusoid for which a delta modulator does not have slope overload. Quantizing step size is 250 mV . Derive the expression used. [6]
- b) A scrambler is shown in figure 1. design the corresponding descrambles. If a sequence $S=101010100000111$ is applied to the input of his scrambles, determine the output sequence T. Verify that if this T is applied to the input of the descrambles, the output is the sequence S. [8]



- c) Explain classification of random process with mathematical expressions. [6]

P.T.O.

- Q3)** a) Derive the expression of signal to noise ratio (S/N) of integrator and dump filter, explain its operation. [8]
 b) A polar NRZ signal is applied at the input of matched filter. The binary 1 is represented by rectangular pulses of amplitude A and duration T and the binary 0 is represented by a rectangular pulse of amplitude -A and duration T. Obtain the impulse response of the matched filter and sketch it. [8]

OR

- Q4)** a) Derive the expression for signal to noise ratio and error probability of a matched filter in the presence of white Gaussian noise. [8]
 b) Explain Geometrical representation of signal and Gram-Schmitt procedure. [8]

- Q5)** a) Derive the expression for error probability of BPSK receiver. [8]
 b) Give the mathematical representation of QPSK signal. Draw the signal space diagram of QPSK signal. Write the expression of all the message points in the diagram and explain. [8]

OR

- Q6)** a) Explain M-ary PSK transmitter and receiver with suitable block diagram. What are the advantages of M-ary PSK over M-ary FSK? [8]
 b) Binary data is transmitted using BPSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that error probability is less than or equal to 10^{-4} . Assume noise PSD to be 10^{-10} watt/Hz. ($Q(3.71)=10^{-4}$). [8]

- Q7)** a) What is PN sequence? Explain the three properties of PN sequence with the help of 4 stage shift register. [6]
 b) Draw the block diagram of DSSS system transmitter and receiver. Write functional names inside the block and input signal for each block & explain. [6]
 c) What are multiple access techniques? Explain WDM in detail. [6]

OR

- Q8)** a) Explain DS-SS BPSK transmitter and receiver with suitable block diagram and derive the power spectral density of the same. [6]
 b) Explain the following frequency hop spread spectrum with the help of relevant diagram. [6]
 i) Slow frequency hopping.
 ii) Fast frequency hopping.
 c) Design a three stage feedback shift register with proper taps to generate N=7 PN sequence. Draw the generator block and if the initial state of shift register is 100 (from left to right). Find the output sequence. [6]

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