

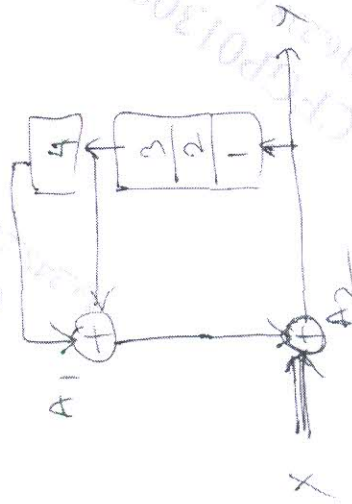
Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks
- 4) Assume suitable data, if necessary.

Q1) a)

The signal $x(t) = 2 \cos 200\pi t + 6 \cos 180\pi t$ is ideally sampled at a frequency of 150 samples per second. The sampled version $x_d(t)$ is passed through a unit gain ideal LPF with a cut off frequency of 110Hz. What frequency components will be present in the o/p of the LPF write down the expression for its o/p signal. [8]

- b) Assuming the initial contents of all the shift registers of the scrambler of fig. given to be zero. Find the o/p sequence y for an input sequence x given by $x = 10101011111$.



A_1 & A_2 are modulo 2 adders

[6]

P.T.O

- c) What do you understand from the statement : 'When a stationary random process is applied as input to an LTI system the input and output processes are jointly stationary?' [6]

OR

Q2) a) Derive an expression for SNR of PCM [6]

- b) For CCIT hierarchy, assume that the first level multiplexer is a synchronous voice PCM bank with 30 input signals. The output bit rate of this multiplexer is 2.048 mb/sec. Find the number of frames transmitted per second. [8]

- c) Find the auto correlation for the given random process, $x(t) = A \sin(Wt + \phi)$ where ϕ is uniformly distributed in the range of 0 to 2π . [6]

Q3) a) Sketch signal space representation of 8 QAM Find euclidian distance for the same. [8]

- b) In a binary transmission, one of the messages is represented by a rectangular pulse $x(t)$. An other message is transmitted by the absence of the pulse. Evaluate the SNR at $t = T$. Assuming white noise with psd equal to $N_0/2$. Also sketch the impulse response of the matched filter and o/p of the matched filter. [8]

OR

Q4) a) Explain likelihood ratio test in detection theory. [8]

- b) Explain gram - schmidt procedure for orthogonalization. [8]

Q5) a) Explain with the help of block diagram FSK transmitter and receiver. [10]

- b) A channel has 80 dB transmission loss and white noise with two sided PSD of $0.5 \times 10^{-10} \text{ W/Hz}$. Binary data is to be transmitted over this channel at a bit rate of 10^5 bits/sec. The BER is not to exceed 10^{-4} find the transmitted power needed for DPSK modulation. [8]

OR

Q6) a) For the input binary sequence 1100110011 sketch all the waveforms for generation of QPSK signal. [10]

- b) For an FSK system, the following data are observed. Transmitted binary data rate = 2.5×10^6 bps PSD of noise is 10^{-20} W/Hz . Amplitude of received signal = $1\mu\text{V}$. Determine the Average probability of symbol error assuming coherent detection. [Given $\text{erfc}(2.2) = 1.84 \times 10^{-3}$] [8]

- Q7) a) Explain with the help of Block diagram FHSS transmitter and receiver. [8]
b) In a DSSS - CDMA system, the data rate $f_b = 6\text{ kbps}$ and the chip rate $f_c = 12\text{ Mbps}$. What is the jamming margin if an output SNR of 10 dB is required for a $p_e = 10^{-5}$? Assume a system loss of 1.5 dB owing to imperfections in tracking and detection. [8]

OR

- Q8) a) Define following terms.
i) Jamming margin
ii) Chip Rate
iii) Processing gain [8]
b) A four bit shift register with feed back connections taken from the outputs of stages 4 and 1 through a modulo - 2 adder, is used for PN sequence generation. Assuming the initial contents of the shift register - to be 1000. Determine the o/p sequence. What is the length of the sequence? Draw the diagram of PN sequence generator. [8]

