Total No. of Questions : 8]

SEAT No. :

P 3278

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TE (E & TC) Electronics

DIGITAL COMMUNICATION

(2012 Pattern)

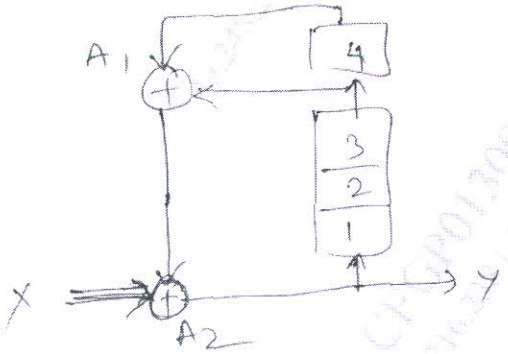
Time : 2½ Hour] *[Max. Marks :70*

Instructions to the candidates:

1) *Attempt Q.1 or Q.2, Q3 or Q4 , Q5 or Q6, Q7 or Q8.*
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 200πt + 6 cos 180 πt is ideally sampled at a frequency of 150 samples per second. The sampled version xδ(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 yforan input sequence x given by x = 10101011 11 11.



A_1 & A_2 are modulo 2 adders **[6]**

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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 + ϕ) 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 absense of the pulse. Evaluate the SNR at t = T. Assuming white noise with psd equal to $N_o/2$. 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 0.5×10^{-10} W/H_2 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/H_2. Amplitude of received signal = 1μV. Determine the Average probability of symbol error assuming coherent detection. [Given erfc (2.2) = 1.84×10^{-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 fb = 6kbps and the chip rate fc = 12 mbps. What is the jamming margin if an output SNR of 10 dB is required for a pe = 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]**

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