6E3089

Roll No. _____ Total No of Pages: 4

6E3089

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014

Electronics & Comm. Engg.

6EC4 Digital Communication

Common with AI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

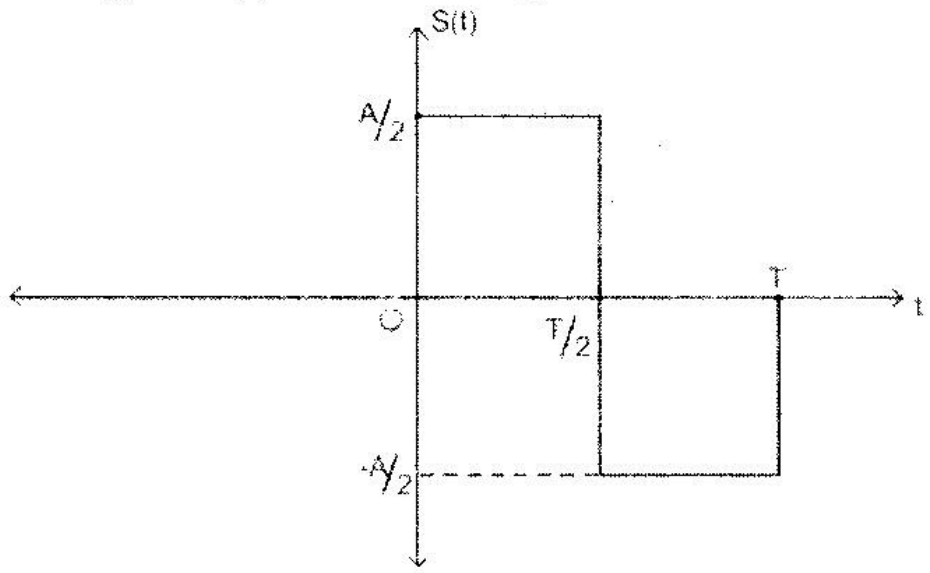
Use of following supporting material is permitted during examination.

1. Nil 2. Nil

UNIT-I

Q.1 (a) Describe Matched Filter and its significance. [8]

(b) Consider the signal s(t) shown in fig.



(i) Determine the impulse response of filter matched to this signal and sketch it as a function of time.

(ii) Plot the matched filter output as a function of time.

(iii) What is the peak value of the output? [8]

OR

Q.1 (a) Explain PCM with block diagrams of transmitter and receiver and find out the error probability in PCM system. [8]

(b) A PCM system uses a uniform quantizer followed by a 7-bit binary encoder. The bit rate of the system is equal to 50×10^6 b/sec.

(i) What is the maximum message bandwidth for which the system operates satisfactorily?

(ii) Determine the output signal-to-quantization noise ratio when a full-load sinusoidal modulating wave of frequency 1 MHz is applied to the input. [8]

UNIT-II

Q.2 (a) Describe various signaling formats with suitable examples. [8]

(b) Sketch the transmitted sequence of pulses for data stream 1110010100 for the following line codes:-

(i) Unipolar NRZ

(ii) Polar Plot

(iii) Bipolar RZ

(iv) Split phase Manchester [8]

OR

Q.2 (a) Explain the Nyquist Criterion for Distortionless Baseband Binary transmission. How can we overcome the practical difficulties encountered with ideal nyquist channel? [12]

(b) A communication channel of bandwidth 75 KHz is required to transmit binary data at a rate 0.1 Mbps using raised cosine pulses. Determine roll-off factor α. [4]

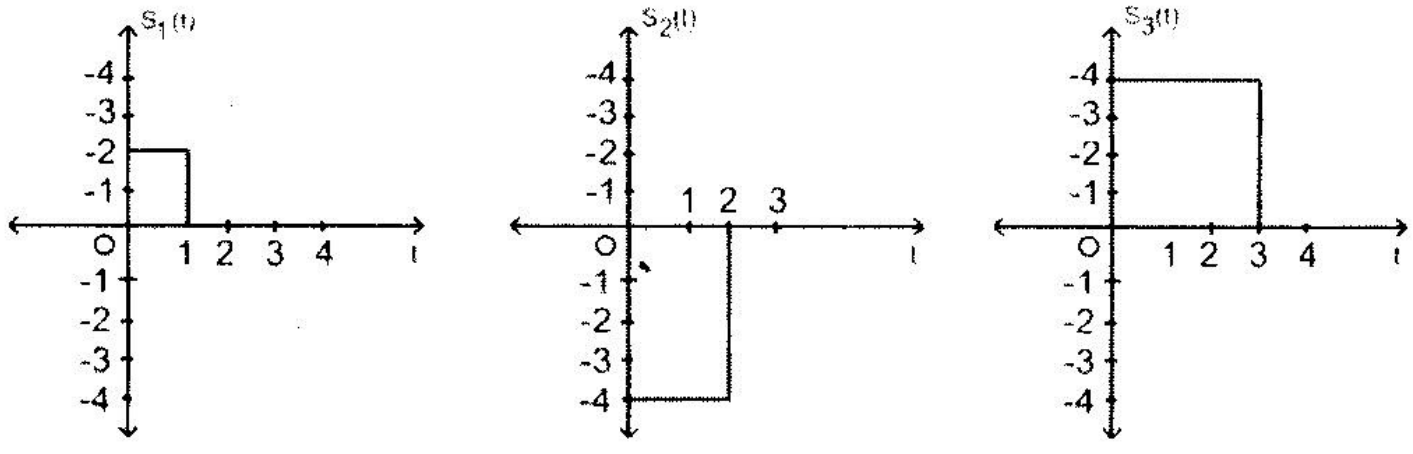
UNIT-III

Q.3 (a) Sketch the waveforms for the inphase and quadrature components of MSK signal in response to the input binary sequence 110100010. [8]

(b) Sketch the MSK waveforms itself for the binary sequence specified in part (a). [8]

OR

Q.3 (a) Using the Gram-Schmidt orthogonalization procedure. find a set of orthonormal basis functions to represent the three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ shown in figure below. [8]



(b) Express each of these signals in terms of the set of basis functions found in Part (a). Construct the corresponding signal space diagram. [8]

UNIT-IV

Q.4 (a) Verify the following expression:-

$0 < H(X) < \log_2 m$

Where. m is the size of alphabet of X. [8]

(b) A discrete memory less source X has four symbols x_1. X_2. X_3 and x_4 with probabilities $P(x_1) = 0.4$. $P(x_2) = 0.3$. $P(x_3) = 0.2$. $P(x_4) = 0.1$.

(i) Calculate H(X).

(ii) Find the amount of information contained in messages $X_1\ X_2\ X_1\ X_3$ and $X_4\ X_3\ X_3\ X_2$ and compare with H(X) obtained in part (i). [8]

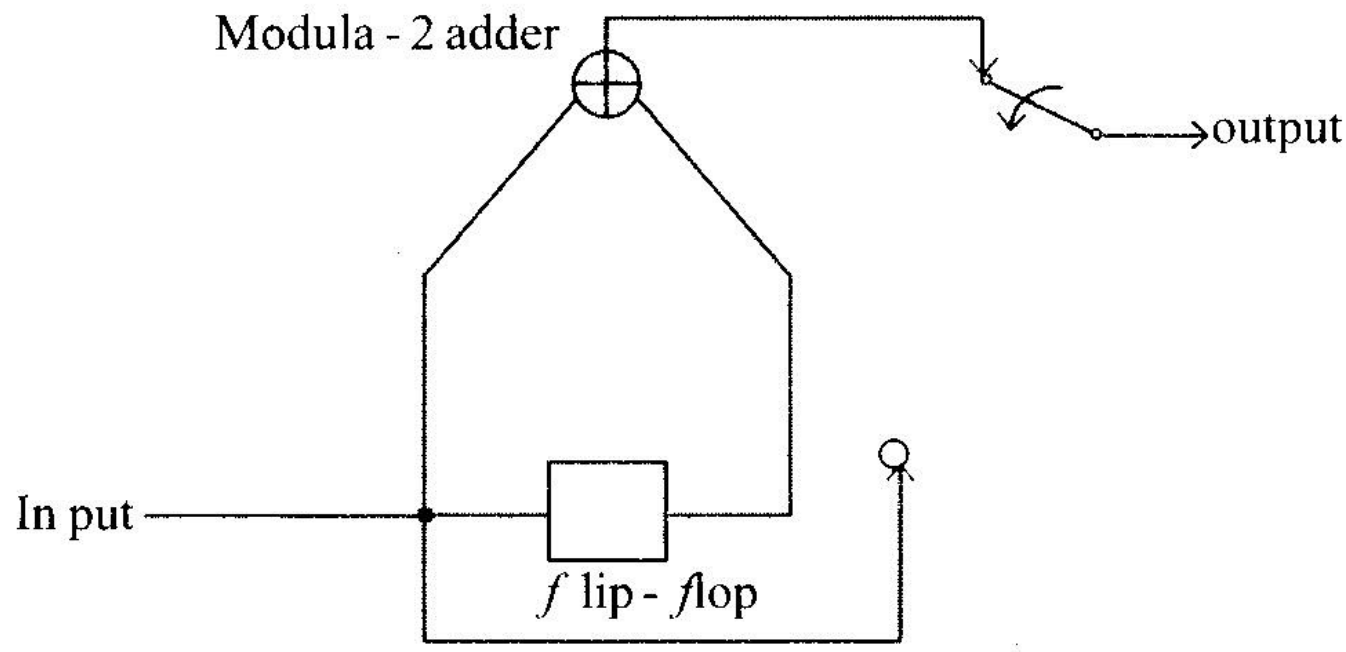
OR

Q.4 (a) A discrete memory less source X has four symbols X_1. X_2. X_3 and X_4 with probabilities $P(x_1) = 1/2$. $P(x_2) = 1/4$. $P(x_3) = P(x_4) = 1/8$. Construct a Shanon-Faano Code for X: Show that this code has the optimum property that $n_1 = 1(x_1)$ and that code efficiency is 100%. [8]

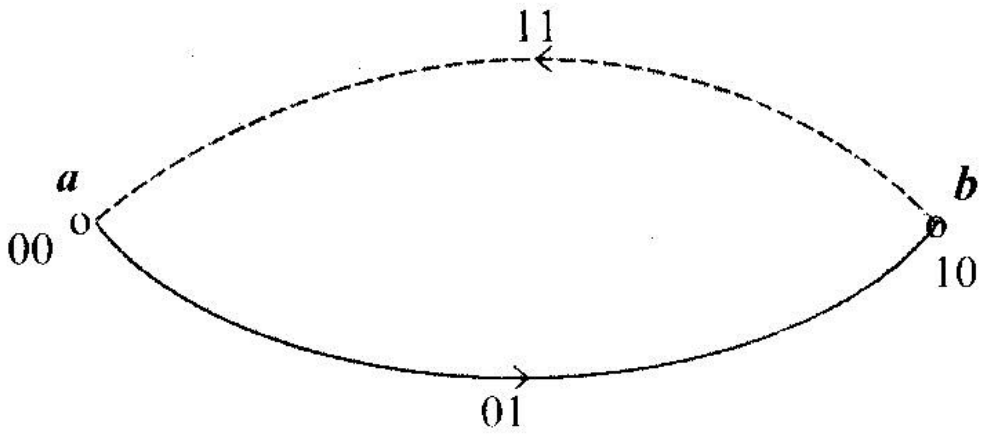
(b) Consider an AWGN channel with 4 KHz bandwidth and noise power spectral density $\eta/2 = 10^2$ W/Hz. The signal power required at the receiver is 0.1 mW. Calculate the capacity of this channel. [8]

UNIT-V

Q.5 (a) Consider the rate r =1/2. Constraint length K = 2 convolutional encoder of the figure given below. The code is systematic. Fine the encoder output produced by message sequence 10111.... [8]



(b) Sketch the code tree for a convolutional encoder of rate r = 1/2. Constraint length K=2 given below:-



Transition from 'a' to 'b' when input message bit is '1' and output is '11'

OR

Q.5 (a) For the (7.4) Hamming code. The parity check H is given by

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

(i) Construct the Generator matrix.

(ii) Find the code word that begins with 1010.

(iii) If the received codeword Y is 0111100, then decode this received codeword. [8]

(b) Find the generator matrix corresponding to G(p) =p3+p2+1 for a (7.4) cyclic code and find out the code vectors. [8]
