Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER III (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2730502 **Date:03/05/2016**

Subject Name: Advanced Digital Communication

Time:10:30 am to 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks**

Q.1 **(a)** What is the significance of the Transforms? With proper example explain the Hilbert transform. List out the properties of Hilbert transform. **07**

(b) Find the analytic signal (Pre-envelope OR Low-pass signal) from its band pass representation. State the significance of this presentation. **07**

Q.2 **(a)** The signal X(t) has energy Ex and signal Y(t) has energy Ey. Signal X(t) and Y(t) are orthogonal to each other. Find energy of new signals X(t) + Y(t) and X(t) – Y(t). **07**

Is there any relation between energy of newly defined signal.

(b) The basis signals of a three (3) dimensional signal space are given by **07**

$\psi_1 = p(t)$, $\psi_2 = p(t\text{-}To)$ and $\psi_3 = p(t\text{-}2To)$ where p(t) is given as,

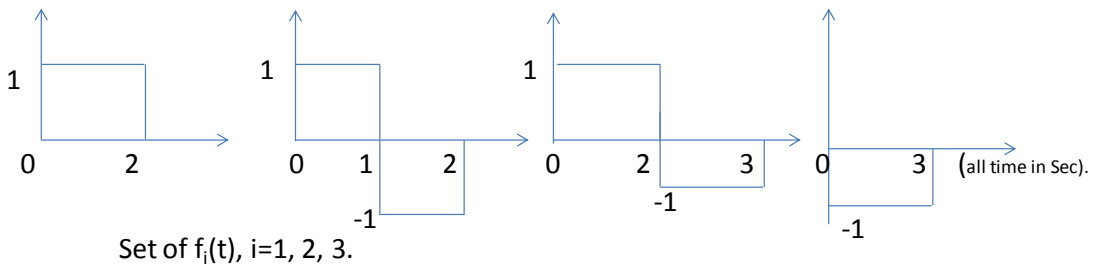
$p(t)=(To)^{-0.5}[\,U(t) - U(t\text{-}To)]$ [note: U(.) is unit step function]

Sketch the waveform of signals ψ_1 ψ_2 and ψ_3 represented by (2,-1,1) , (3,2,-0.5) and (-0.5,-1,1).

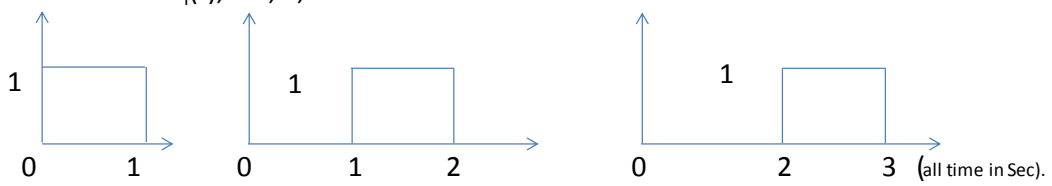
OR

(b) For the given set of signal as below, Is it possible to represent the set of Si(t) in terms of fi (t)? If possible then state the reason for the same and do represent all Si(t) in terms of fi(t) and draw signal space diagram. **07**

Set of $S_i(t)$, i=1, 2, 3, 4.



Set of $f_i(t)$, i=1, 2, 3.



Q.3 **(a)** Explain M-ary Frequency Shift Keying (FSK) modulation technique with example of 4 ary systems. What is the problem with FSK modulated signal? **07**

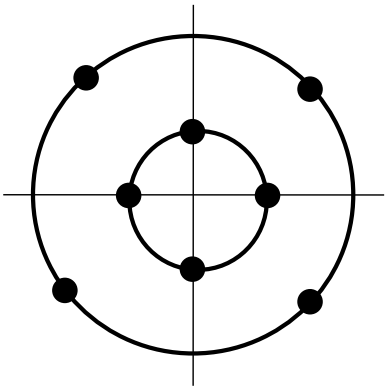
(b) What is simplex signal and multi-dimensional signal? Explain the properties of the simplex signal. **07**

OR

Q.3 **(a)** Find the basis functions of Quadrature Amplitude Modulated signal and plot constellation diagram for 16 QAM signal. **07**

(b) Explain the costas loop method for generating the properly phased carrier at receiver end. **07**

Q.4 **(a)** In 8 QAM the shortest neighbor signal points are separated by distance of unit A. **07**



Find the total average power transmitted by transmitter if this QAM constellation is used by transmitter.

(b) With proper block diagram explain "Non decision Directed Timing Estimation" technique **07**

OR

Q.4 **(a)** With proper block diagram explain the M-ary Optimum receiver for AWGN channel. Explain function of each block in detail. **07**

(b) Often times, providing more E_b/N_o will not mitigate the degradation due to inter symbol interference (ISI). Explain why this is the case. Explain design of band-limited signals with controlled ISI. **07**

Q.5 **(a)** Explain significance of parallel transmission. Give the block diagram of Orthogonal Frequency Division Multiplexing (OFDM) based transmitter and receiver system . **07**

(b) Why equalizer is required in communication system? With proper block diagram explain the Adaptive equalizer system. **07**

OR

Q.5 **(a)** What is fading? With two ray model explain what happen to transmitted signal due to multipath (two path) channel. **07**

(b) Explain Code Division Multiple access method. Explain how it provide the multiuser capability in it. **07**

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