Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS NOV/DEC 2016

SUBJECT: COMMUNICATION SYSTEMS [ELE 3103]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 29 November 2016** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Find the Fourier transform of the function shown in fig Q1A in terms of *sinc* function. Plot the magnitude spectrum and hence find the bandwidth. ***(03)***

1B. A square law device has an input output relation given by $e_0(t) = ae_1(t) + be_1^2(t)$. a, b are constants, $e_1(t)$ is the input voltage and $e_0(t)$ is the output voltage. The input voltage is defined by $e_1(t) = A_c\cos 2\pi f_c t + m(t)$ where m(t) is a message signal and $A_c\cos 2\pi f_c t$ is the carrier wave. Evaluate the output voltage $e_0(t)$. Specify the frequency at which the band pass filter to be tuned , in order to generate an AM signal . ***(03)***

1C. Two signals $m_1(t)$ and $m_2(t)$ need to be transmitted over a channel using an arrangement shown in fig Q1C.

i. Sketch signal spectra at point c.
ii. Determine the minimum bandwidth of the channel.
iii. Design a receiver to recover signals $m_1(t)$ and $m_2(t)$ from the modulated signal at point c. ***(04)***

2A. With necessary equations, evaluate the bandwidth requirement for narrow band FM. ***(03)***

2B. Discuss the methods to improve the signal to noise ratio in FM. ***(03)***

2C. Prove the Interpolation formula for reconstructing the original continuous time signal g(t) from its sequences of sample values. ***(04)***

3A. Three low pass signals of bandwidth 20 KHz, 30 KHz and 40 KHz are sampled and time division multiplexed using PAM. The TDM signal is passed through a low pass filter and then transmitted over a channel.

i. Determine the maximum sampling rate for each channel.
ii. Determine the minimum channel bandwidth required to transmit the multiplexed signal. ***(02)***

3B. For the signal x(t) shown in fig Q3B,

i. Plot the matched filter output as a function of time.
ii. Determine the peak value of output. ***(03)***

3C. Determine the probability of error for ASK scheme when bit 0 is transmitted and bit 1 is received. Hence find the probability of error in terms of complementary error function when binary data is transmitted using ASK over an AWGN channel at a rate 2.4Mbps, carrier amplitude 1mV. Assume Noise power spectral density, $NO/2 = 10^{-15}$ W/Hz. ***(05)***

4A. Consider the set of signals, $s_i(t) = \sqrt{\frac{2E}{T}}\cos(2\pi f_c t + i\frac{\pi}{4})$, $0 \leq t \leq T$ where i=1,2,3,4 and $f_c = n_c / T$ for some fixed integer n_c. Plot the locations of $s_i(t)$, i=1,2,3,4 in the signal constellation diagram by finding the orthonormal basis functions. ***(03)***

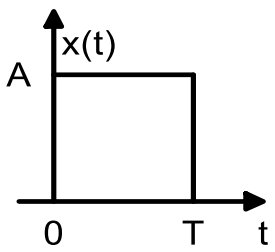
4B. Discuss the transmitter and receiver for BFSK scheme with block diagram. ***(03)***

4C. For a convolutional encoder with a rate equal to ½, Trellis is shown in figQ4C. If the received sequence is [1 1 0 0 0 0 1 1 1 0], determine the correct sequence using Viterbi decoding algorithm. Show the flow of algorithm. ***(04)***

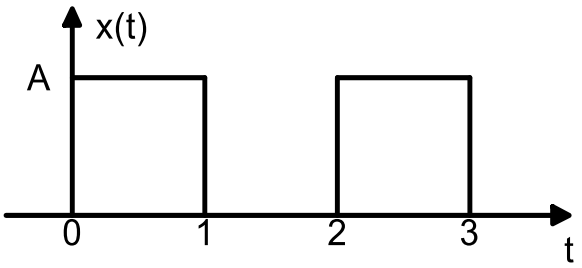
5A. For a (7,4) systematic cyclic code with generator polynomial $g(x) = 1 + x^2 + x^3$, determine the code polynomial for the message block [1011]. ***(03)***

5B. Consider a systematic (7,4) linear block code whose parity check equations are b1= m1⊕ m2⊕m4, b2=m1⊕m3⊕m4, b3=m1⊕m2⊕m3, b4=m1⊕m3⊕m4. Find the generator matrix and parity check matrix for this code. ***(03)***

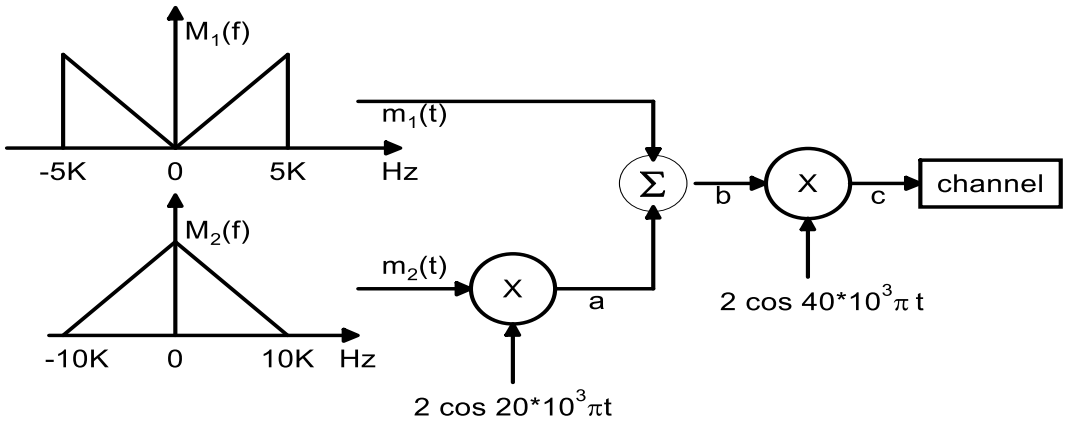
5C. Discuss the Handoff- strategies in wireless communications. ***(04)***



figQ1A



FigQ3B



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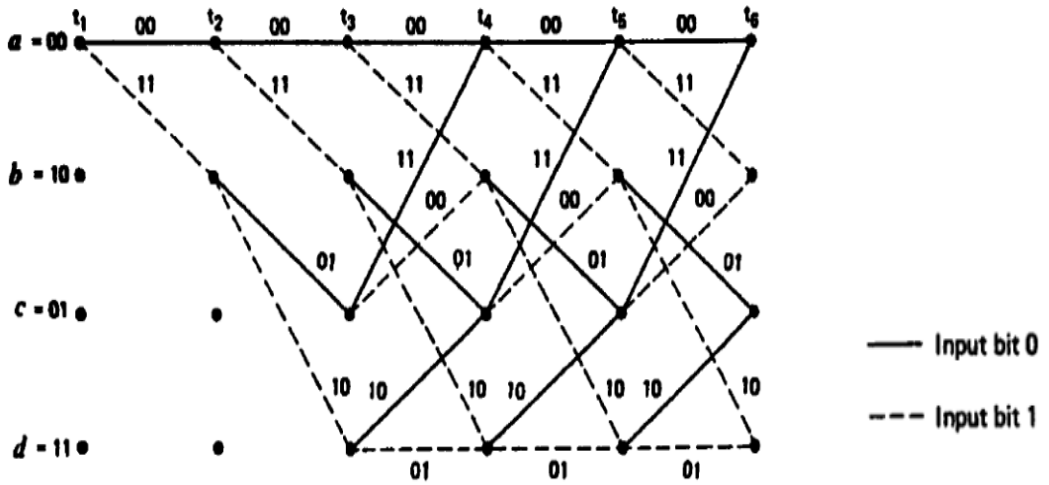

Fig Q4C