Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE UP EXAMINATIONS, DEC 2015 / JAN 2016

SUBJECT: COMMUNICATION SYSTEMS [ELE 305]

REVISED CREDIT SYSTEM

Time: 3 Hours | 02 January 2016 | MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. Explain the characteristics of white noise. Find the autocorrelation function of the ideal low pass filtered white noise spectra, where the midband frequency is fc and bandwidth 2B.(Consider both positive and negative frequencies) **(04)**

1B. A message signal $A_m\cos 2\pi f_m t$ is used to amplitude modulate a carrier $A_c\cos 2\pi f_c t$. With suitable expressions draw the spectrum of the modulated signal. Also determine the total power associated with the modulated carrier. **(03)**

1C. A signal g(t) = 2cos400πt + 6cos640πt is ideally sampled at fs = 500Hz. If the sampled signal is passed through an ideal low pass filter with a cut off frequency of 400Hz. Draw the spectrum and show the frequency components that will appear in the filter output. **(03)**

2A. Let the message signal $8\cos(2*10^2\pi t)$ frequency modulates the carrier signal, $c(t) = 10\cos(20*10^6\pi t)$ with Kf = 50 Hz/Volt. Plot the spectrum of WBFM signal using Bessel function table (table 1). Calculate the power of modulated signal present in the carrier and in the significant side frequency components. **(04)**

2B. Explain the T1 digital carrier system for telephony. **(03)**

2C. A single tone FM is represented by the voltage equation as $v(t) = 12\cos[5x10^8t + 5\sin 1250t]$. Determine a) modulation index b) power dissipated in 10Ω resistor c) carrier swing **(03)**

3A. What is meant by indirect FM generation? Discuss about the generation of WBFM using indirect method **(05)**

3B. An instantaneous sampled analog signal is multiplied by a periodic train of rectangular pulse c(t). Given that the pulse repetition frequency of this periodic train is fs and amplitude is one, then perform the following.

a) Find the expression of the signal in time domain, s(t).
b) Discuss the method to recover the signal from its sampled version. **(03)**

3C. In digital communication system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency is 100 MHz. Find the symbol rate of transmission and bandwidth requirement of the channel if the following techniques are used.
a) QPSK system
b) BFSK system **(02)**

4A. Explain QPSK transmitter and receiver with the help of block diagram. Draw the signal space representations of each symbol. **(05)**

4B. State sampling theorem and derive interpolation formula. **(05)**

5A. For a (7,4) systematic cyclic code with g(x) = 1 + x2 + x3. Determine the code word if the message sequence is [1110] **(03)**

5B. For a (6, 3) linear block code the parity bits are b 0 = m 0 + m 1 ; b 1 = m 1 + m 2 ; b 2 = m 0 + m 2 .

a) Find the code vector for message sequence [1 1 0]

b) If the received sequence is [1 1 1 0 1 0] then evaluate the syndrome vector. If the received sequence is erroneous then find the location of the error. **(04)**

5C. The trellis diagram of a rate-1/2, constraint length-3 convolutional code is shown in fig.1. The all-zero sequence is transmitted, and the received sequence is 10001000. Using the Viterbi algorithm, compute the decoded sequence. **(03)**

6A. Explain the following with respect to cellular communication

a) Dwell time

b) Cell sectoring and splitting

c) Handoff strategy **(05)**

6B. Why FM is superior to AM? Explain FM microwave radio system with block diagram **(05)**

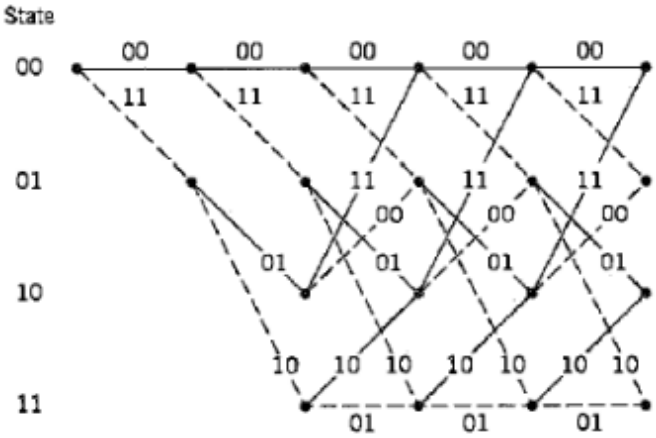

Figure 1

Table 1

Modulation index	Sideband																
	Carrier	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0.00	1.00																
0.25	0.98	0.12															
0.5	0.94	0.24	0.03														
1.0	0.77	0.44	0.11	0.02													
1.5	0.51	0.56	0.23	0.06	0.01												
2.0	0.22	0.58	0.35	0.13	0.03												
2.41	0	0.52	0.43	0.20	0.06	0.02											
2.5	−0.05	0.50	0.45	0.22	0.07	0.02	0.01										
3.0	−0.26	0.34	0.49	0.31	0.13	0.04	0.01										
4.0	−0.40	−0.07	0.36	0.43	0.28	0.13	0.05	0.02									
5.0	−0.18	−0.33	0.05	0.36	0.39	0.26	0.13	0.05	0.02								
5.53	0	−0.34	−0.13	0.25	0.40	0.32	0.19	0.09	0.03	0.01							
6.0	0.15	−0.28	−0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02							
7.0	0.30	0.00	−0.30	−0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02						
8.0	0.17	0.23	−0.11	−0.29	−0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03					
8.65	0	0.27	0.06	−0.24	−0.23	0.03	0.26	0.34	0.28	0.18	0.10	0.05	0.02				
9.0	−0.09	0.25	0.14	−0.18	−0.27	−0.06	0.20	0.33	0.31	0.21	0.12	0.06	0.03	0.01			
10.0	−0.25	0.04	0.25	0.06	−0.22	−0.23	−0.01	0.22	0.32	0.29	0.21	0.12	0.06	0.03	0.01		
12.0	0.05	−0.22	−0.08	0.20	0.18	−0.07	−0.24	−0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.07	0.03	0.01