Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent Institution of MAHE, Manipal)

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
MAKEUP EXAMINATIONS, DECEMBER 2018
SUBJECT: COMMUNICATION SYSTEMS [ELE 3103]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 26, December 2018** **Max. Marks: 50**

Instructions to Candidates:

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

1A. Derive the equation of transmitted power with respected to modulation index and carrier power for an Amplitude modulated wave, where the baseband signal is $A_m \cos 2\pi f_m t$ and carrier signal is $A_c \cos 2\pi f_c t$. ***(03)***

1B. Explain Single Side Band AM signal generation and detection with block diagram and mathematical expressions. ***(05)***

1C. A carrier wave of frequency 10MHz and peak value 10V is amplitude modulated by a 5KHz sine wave of amplitude 6V. Draw the amplitude spectrum in terms of its modulation index. ***(02)***

2A. Consider an FM signal with : frequency deviation, Δf = 10 kHz, frequency of message signal, fm = 10 kHz, amplitude of carrier signal ,Ac = 10 V, frequency of the carrier signal, fc = 500 kHz. Draw the spectrum for FM signal. Use the Bessel table as given in table 1. ***(03)***

2B. Discuss the FM slope detection technique with block diagram. ***(04)***

2C. For an indirect FM transmitter , with the following parameters, determine

a)Carrier frequency b) modulation index of NBPM modulator

c) Frequency deviation and modulation index at the 2nd multiplier output.

(Given: transmit carrier frequency= 102MHz; First multiplier,n1= 48 ; 2nd multiplier , n2= 64

Crystal reference oscillator frequency = 10MHz,;Δf at modulator = 24.5Hz ; message signal frequency, fm = 50Hz) ***(03)***

3A. Discuss the concept of FM stereo multiplexing and demultiplexing concept with block diagram. ***(03)***

3B. For the following signal s2(t) shown in fig 3B,

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

b) Specify the peak value of the output.

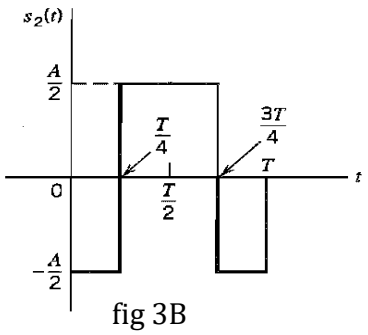

fig 3B

(04)

3C. 24 voice signals are sampled uniformly and then time division multiplexed. The sampling operation uses the flat-top samples with 1microsec duration. The multiplexing operation includes provision for Synchronization by adding an extra pulse of sufficient amplitude and also 1micro second. Assuming a sampling rate of 8KHz, calculate the spacing between successive pulses of the multiplexed signal. ***(03)***

4A. For a Binary Phase Shift Keying technique ,

a) Find the set of orthonormal basis functions to represent this set of signals.

b) Obtain the coordinates of message points and then draw the signal constellation diagram.

c) Draw the BPSK waveform for the message signal 011010 (consider bit rate = carrier frequency).

d) Draw the block diagram of transmitter and receiver of BPSK scheme. ***(05)***

4B. A (6,3) linear block code is generated according to the parity bit equations

b1= m1+ m2+m3 ; b2 = m2+ m3 ; b3= m1+m2

a) Find the generator matrix

b) Find the code word for the transmitted message 110 with the given specifications

c) Let received code r=[1 1 0 1 1 1]. Decode this received word by finding the location of the error and obtain the correct code word. ***(05)***

5A. Draw the convolution encoder structure with generator polynomials, $g_1(D) = 1 + D + D^2$, $g2(D) = 1 + D^2$. Find the code vector corresponding to the message 10011 using state diagram for the given convolutional encoder. ***(03)***

5B. Decode the message signal for received sequence 01 00 01 00 00 for a convolutional encoder with state table given as below.(Consider the state assignment A= 00, B=10, C=01,D=11)

Present state	Next State (with input=0)	Next State (with input =1)	Code Vector (with input=0)	Code Vector (with input=1)
A	A	B	00	11
B	C	D	01	10
C	A	B	11	00
D	C	D	10	01

(07)

Table 1 : Bessel Table

Modulation index	Sideband										
	Carrier	1	2	3	4	5	6	7	8	9	10
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		