Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: COMMUNICATION SYSTEMS [ELE 3103]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 23, November 2018** **Max. Marks: 50**

Instructions to Candidates:

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

1A. A carrier signal of 1V amplitude and sinusoidal modulating signal of 0.5V, put in series, are applied to a square law modulation characteristics

$$i_o=\left(10 + kV_i + k'V_i^2\right) mA$$

where V_i is the input in volts. k=2mA/V & k′=0.2mA/V^2. Considering only the frequency components of the AM signal corresponding to the carrier frequency, find the depth of the modulation in the resulting AM signal. ***(03)***

1B. Explain DSBSC generation and detection with block diagram and mathematical expressions. Evaluate the effect of phase error φ, in the local carrier of the detector. ***(05)***

1C. A message signal with bandwidth 10 KHz is Lower-Side Band SSB modulated with carrier frequency $fc_1 = 10^6 Hz$. The resulting signal is then passed through a narrow-band frequency modulator with carrier frequency $fc_2 = 10^9 Hz$. Then find the bandwidth of the output. ***(02)***

2A. A single tone FM is represented by the voltage equation as
$V(t) = 12\cos(6 \times 10^8 t + 5 \sin 1250t)$. Determine

i. Carrier frequency
ii. Modulating frequency
iii. Modulation index
iv. Frequency deviation
v. Highest and lowest frequencies obtained by the modulated signal.
vi. Power dissipated in 10Ω resistor. ***(03)***

2B. Explain FM super heterodyne receiver with the help of block diagram. Explain why FM is more robust than AM. ***(04)***

2C. Explain one application of VSB modulation with the spectrum of filter response. ***(03)***

3A. Discuss the concept of Time division multiplexing with block diagram. ***(03)***

3B. Consider the signal $s(t) = \begin{cases} 2, for\ 0 \le t \le \frac{T}{2} \\ -1, for\ \frac{T}{2} \le t \le T \end{cases}$

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

b) Plot the matched filter output of s(t) as a function of time. ***(04)***

3C. Figure Qn.3C shows the spectrum of a message signal x(t). The signal is sampled at the rate of f_s = 1.5 f_{max}, where f_{max} = 1 Hz, is maximum signal frequency. Sketch the spectrum of sampled version of the signal. If the sampled signal is passed through an ideal LPF of bandwidth f_{max}, sketch the spectrum of the output signal from this filter. ***(03)***

4A. For a Binary Frequency 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 BFSK waveform for the message signal 011010 (consider bit rate = carrier frequency). ***(03)***

4B. The binary sequence 1100100010 is applied to the DPSK transmitter.

a) Sketch the resulting waveform at the transmitter output with the help of the DPSK transmitter block diagram.

b) Applying this waveform to the DPSK receiver (with block diagram) show that, the original binary sequence is reconstructed at the receiver output. ***(04)***

4C. Construct a [7, 4] cyclic code, where the generator polynomial coefficients are 1011. Find the code vector for the message 0101. ***(03)***

5A. Draw the convolution encoder structure with generator polynomial g1(D) = $D+D^3$, g2(D) = $D+D^2$,g3(D)= $1+D+D^2$. Find the code vector corresponding to the message 1100 using state diagram for the given convolutional encoder. Justify your answer with generator polynomial concept. ***(04)***

5B. Decode the message signal for a received sequence 011100 using Viterbi Decoding algorithm. State table for the convolutional encoder is as follows. (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

(03)

5C. With block diagram explain how CDMA technology is used in mobile communication ***(03)***

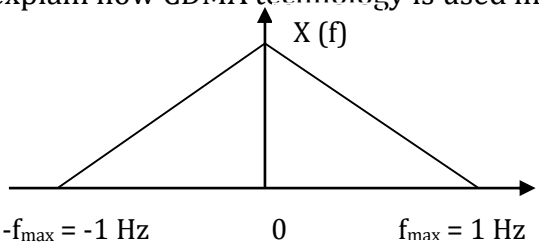

Figure Qn.3C