Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: DIGITAL COMMUNICATION [ICT 2152]

REVISED CREDIT SYSTEM
(02/12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Assume that source 1 sends the message 'MANIPAL' starting from time instant t_0. Source 2 sends the message 'IS A PLACE' starting from time instant t_1. (The space between characters represents the silent period of the source.) Depict the transmission of these messages using Synchronous and Statistical Time Division Multiplexing technique. State the drawbacks of Synchronous TDM over Statistical TDM. **(05)**

1B. Explain the transmission impairments that are specific to wireless line of sight transmission. **(03)**

1C. Compare and contrast asynchronous and synchronous transmission techniques. **(02)**

2A. Using the CRC-digital logic technique, find the transmitted code word for a message consisting of a 0 followed by eight 1's, if polynomial $P(X) = X^8 + X^7 + X^2 + 1$. Assuming error free transmission occurs, show how the receiver checks for error and interprets the message from received codeword. **(05)**

2B. Explain the concept of Direct Sequence Spread Spectrum System using suitable block diagram of transmitter and receiver. **(03)**

2C. Illustrate the significance of using sequence numbers and timer for each frame at the sender side in Stop and Wait ARQ error control protocol. **(02)**

3A. Given that PN sequence is 0011011000 and the input binary data is 01110011110110000011, depict the allocation of channel using Fast Frequency Hop Spread Spectrum with MFSK. Assume f_c = 25 KHz, f_d = 500 Hz, M = 4 and k = 2. Calculate the frequencies available for MFSK. **(05)**

3B. Explain the three types of wireless propagation using suitable diagrams. **(03)**

3C. Suppose a transmitter produces 60 W of power.

i) Express the transmit power in units of dBm and dBW.

ii) If the transmitter's power is applied to a unity gain antenna with a 700-MHz carrier frequency, what is the received power in dBm at a free space distance of 80 m? **(02)**

4A. Draw the waveform of the data D = 0 1 0 0 1 1 1 0 0 1 using the following encoding schemes.

i) NRZI
ii) Bipolar AMI
iii) Manchester
iv) Differential Manchester.

State the advantages of Manchester encoding scheme when compared to other encoding techniques. **(05)**

4B. Calculate the channel capacity for a teleprinter channel with a 300 Hz bandwidth and a signal-to-noise ratio of 3 dB, where the noise is white thermal noise. Also compute the spectral efficiency and E_b/N_o in dB. **(03)**

4C. Explain piggybacking mechanism used in Sliding Window flow control protocol. **(02)**

5A. Sender 'A' and Receiver 'B' are connected through an unreliable network which has smaller bandwidth-delay product and noisy channel. Justify why Selective Reject ARQ is a preferred error control protocol for this network. Draw the sender and receiver windows using vertical time line diagram for the given scenario where a 3 bit sequence field is used with maximum window size when:

i) Frame 0 is sent; Frame 0 is acknowledged.
ii) Frames 1 and 2 are sent; Frames 1 and 2 are acknowledged.
iii) Frames 3, 4, and 5 are sent; Frames 3 and 4 are acknowledged; Timer for Frame 5 expires.
iv) Frames 5, 6, and 7 are sent; Frames 5 through 7 are acknowledged. **(05)**

5B. Differentiate between random access and scheduling approach to medium access control. Justify why CSMA/CD is suitable for Ethernet LAN structure. **(03)**

5C. With a neat block diagram, explain the process of Pulse Code Modulation and justify the need for companding. **(02)**