



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (INFORMATION TECHNOLOGY) MAKE UP END SEMESTER EXAMINATIONS, JANUARY 2017

SUBJECT: PRINCIPLES OF DATA COMMUNICATION [ICT 2104]

REVISED CREDIT SYSTEM (04/01/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitably assumed.
- 1A. Consider the generator polynomial $P(X) = X^4 + X^3 + 1$ and the information sequence 1 0 0 1 1 0 1 1 0 1 1. Use polynomial method to find the code word corresponding to the information sequence. If $E(X) = X^8 + X^6 + 1$ is error polynomial, write the received bit pattern. Is the error detected? Justify using polynomial method.
- **1B.** A data communication model exists that shows how information exchange takes place. With a diagram illustrate how basic information exchange takes place.
- **1C.** Consider 48 voice signals are to be multiplexed and transmitted over twisted pair. What is the bandwidth required for FDM? Assuming a bandwidth efficiency of 1 bps/Hz, what is the bandwidth required for TDM using PCM?

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- **2A.** With a vertical time sequence diagram, depict the communication between the transmitter and receiver using HDLC protocol with selective reject ARQ. Assume a window size of 7.
 - i. A initializes the link and B acknowledges it.
 - ii. B transmits the first four data frames.
 - iii. A transmits its first two data frames once it receives third frame from B but before fourth frame reception.
 - iv. Fourth frame sent by B is a damaged frame and A rejects the same.
 - v. A's reject is lost. B doesn't send more frames. Depict timeout scenario at B.
 - vi. A responds, and B resumes with two frames.
 - vii. A does not have data frames to send but needs to acknowledge.
 - viii. B initiates for disconnection, A acknowledges it.
- **2B.** A transmitter has an output of 0.1 W at 3 GHz. Assume that this transmitter is used in a microwave communication system where the transmitting and receiving antennas are parabolas, each 1.2 m in diameter.
 - i. What is the gain of each antenna in decibels?
 - ii. Taking into account antenna gain, what is the effective radiated power of the transmitted signal?
 - iii. If the receiving antenna is located 30 km from the transmitting antenna over a free space path, find the available signal power out of the receiving antenna in dBm units.

2C.	Datagram packet switching and virtual-circuit packet switching are two packet switching techniques. How are they different from each other?	02
3A.	What is the significance of pulse stuffing in TDM? Assume ten sources, six with a bit rate of 200 kbps and four with a bit rate of 400 kbps are to be combined using multilevel TDM with no synchronizing bits. Answer the following questions about the final stage of the multiplexing: i. What is the size of a frame in bits? iii. What is the duration of a frame?	05
	ii. What is the frame rate? iv. What is the data rate?	05
3B.	Differentiate between slow and fast FHSS.	03
3C.	In Go Back N ARQ, what can happen during the following contingencies: i. Damaged frame?	
	ii. Damaged acknowledgement?	02
4A.	 For the input bit stream 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 1	05
4R	V. HDDS.	03
4C.	Consider the use of 1000-bit frames on a 1Mbps satellite channel with a 270ms delay. What is the maximum link utilization for Stop-and-wait flow control?	00
	i. Continuous flow control with a window size of 127?	02
5A.	Mention the design factors related to the transmission medium. Write physical description of coaxial cable and discuss its transmission characteristics.	05
5B.	A high-quality speech signal has a bandwidth of 6 kHz. Suppose that the speech signal is to be quantized and then transmitted over a 30 kbps modem. What is the SNR of the received speech signal?i. Suppose that instead a 64 kbps modem is used? What is the SNR of the received speech signal?	
-0	ii. What modem speed is needed if we require an SNR of 40 dB?	03
5 C.	An FHSS system employs a total bandwidth of 600MHz and an individual channel bandwidth of 100Hz. What is the minimum number of PN bits required for each frequency hop, if BPSK signaling scheme is used for encoding the data stream?	02