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

FIFTH SEMESTER B.Tech. (CSE) END SEMESTER EXAMINATION

SUBJECT: Data Communication (Programme Elective) – (CSE 4025)

Time: 3 hours **Date: 22-11-2019** **Max Marks: 50**

NOTE: DO NOT SEEK ANY CLARIFICATIONS FROM THE INVIGILATOR. MISSING DATA MAY BE ASSUMED SUITABLY.

Answer all the questions

1 a)	Brief the key characteristics of data communication system.	4 M
1 b)	Explain the metrics effecting the performance of digital communication.	3 M
1 c)	How repeaters are incorporated in ring topology? Mention its advantages and disadvantages?	3 M
2 a)	i) If a periodic signal is decomposed into five sine waves with frequencies of 100, 300, 500, 700, and 900 Hz, what is its bandwidth? Draw their spectrum (range of frequencies), assuming all components have a maximum amplitude of 2 V. ii) Compute the maximum bit rate for a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels.	4 M
2 b)	How latency is computed in data transmission? What are the propagation time and the transmission time for a 2.5 Kbps message (an e-mail) if the bandwidth of the network is 1 Gbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at 2.4×10^8 m/s.	3 M
2 c)	Derive the relationship between data rate and signal rate. Enumerate signal and data elements with suitable sketch.	3 M
3 a)	Compute NRZ L, NRZ I, Differential Manchester and Bipolar AMI line coding for the binary sequence 0100110001.	4 M
3 b)	What is the required bandwidth for the following cases if we need to send 4000 bps? Let d = 1. i. ASK ii. FSK with $2\Delta f = 4$ KHz	2 M

3 c) Draw the constellation diagram for the following cases. Find the peak amplitude value for each case and define the type of modulation (ASK, FSK, PSK) with proper justification. The numbers in parentheses define the values of I and Q components respectively. 4 M

i. Two points at (2, 0) and (3, 0)
ii. Two points at (3, 0) and (−3, 0)
iii. Four points at (2, 2), (−2, 2), (−2, −2), and (2, −2)

4 a) A multiplexer combines four 100-kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration? 3 M

4 b) Given the data word 10100111 and the divisor 10111, 4M

i) Show the generation of the code word at the sender site (using polynomial division).
ii) Show the checking of the code word at the receiver site (assume no error).

4 c) Five equal-size datagrams belonging to the same message leave for the destination one after another. However, they travel through different paths as shown in the table 4c.1. We assume that the delay for each switch (including waiting and processing) is 3, 10, 20, 7, and 20 ms respectively. Assuming that the propagation speed is 2×10^8 m/s, find the order the datagrams arrive at the destination and the delay for each. Ignore any other delays in transmission. 3M

Table 4c.1

Datagram	Path Length	Visited Switches
1	3200 km	1,3,5
2	11,700 km	1,2,5
3	12,200 km	1,2,3,5
4	10,200 km	1,4,5
5	10,700 km	1,4,3,5

5 a) Explain in detail the authentication process and the packets encapsulated in a CHAP protocol with a neat diagram. 3M

5 b) What are the three persistent methods associated with CSMA network? Explain them with a neat flow diagram. 4M

5 c) In the Standard Ethernet with the transmission rate of 10 Mbps, we assume that the length of the medium is 2500 m and the size of the frame is 512 bits. The propagation speed of a signal in a cable is normally 2×10^8 m/s. Calculate the efficiency of the Ethernet. 3M