**CSC 335 Data Communications and Network I**

**Homework 4**

1. (2 point) Please answer what is multiplexing and why we need multiplexing. Differentiate between frequency and time division multiplexing. What are three important link layer services? **Multiplexing is multiple signals being transmitted and sharing the same medium (the same wire). Multiplexing is essential because it allows for higher throughput and more information being transmitted on the same medium. Frequency division multiplexing allows signals to be transmitted simultaneously, each signal utilizing its allocated amount of frequency needed. In time division, all signals also transmit simultaneously, but all signals transmit at the same frequency. The three important link layer services are framing, channel access and error detection.**
2. (2 points) During an online exam, the answer you want to send to a true/false question is Yes. Instead of “Yes”, the only thing you need to send is an uppercase ‘Y’. The ASCII code for ‘Y’ is 89 in decimal and 01011001 in binary. Data Link layer helps you check the data, ‘Y’, that you transmitted to the server to make sure ‘Y’ is not accidentally change to other letter due to the noise and interference during the transmission. The technique to check the content is called cyclic redundancy check (CRC). On the transmitter side, CRC encode the message to with redundancy at the tail. On the receiver side, CRC recompute the entire codeword to verify the correctness. Assume the generator polynomial . The message bit is 01011001, which is letter Y. Please encode the message to a 12-bit codeword as the transmitter. Also, show that at the receiver side, the remainder is zero if the codeword is received correctly. **Y (transmit data) is 010110011010.**

**Diagram

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1. (1 points) If the received 13-bit word for the coding scheme from Problem 2 is 1100100010111, what is the remainder? **The remainder is 3.**

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1. (1 point) Please classify medium access control protocols and answer why we need medium access control protocols. **The three medium access control protocols are Channel Partitioning, Random Access and “Taking Turns”. Channel Partitioning subdivides channels to allow for more efficient use of frequency necessary. Random Access ensures collisions do not occur. Taking Turns, is basically equivalent to a queue, nodes take turns sending data to avoid collisions. Medium access control protocols are necessary to ensure data packets being transferred between two nodes do not collide, and are delivered the way they were sent.**