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**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI**

**FIRST SEMESTER 2023 – 2024**

**COURSE:** CSF303 (Computer Network)

**COMPONENT:** Tutorial Sheet 4 **DATE:** 1st March 2024

1. Suppose we want to transmit the message 11100011 and protect it from errors using the CRC polynomial X3 +1.
   1. Use polynomial long division to determine the message that should be transmitted.
   2. Suppose the leftmost bit of the message is inverted due to noise on the transmission link. What is the result of the receiver’s CRC calculation? How does the receiver know that an error has occurred?
2. Given the following 8 bit pattern 01011100 and the generator polynomial x3+x2+1, compute the CRC bits. Given a 1 bit error that transforms the 8 bit message pattern from 01011100 to 11011100, show that the pattern protected by the above CRC can detect the error.
3. Assume you wish to transfer an n-byte file along a path composed of the source, destination, seven point-to-point links, and five switches. Supposed each link has a propagation delay of 2ms, bandwidth of 4Mbps, and that the switches support both circuit and packet switching. Thus, you can either break the file up to 1-KB packets, or set up a circuit through the switches and send the file as one contiguous bit stream. Supposed that packets have 24 bytes of packet header information and 1000 bytes of payload, that store-and-forward packet processing at each switch incurs a 1-ms delay after the packet has been completely received, that packets may be sent continuously without waiting for acknowledgements, and that circuit setup requires a 1-KB message to make one round-trip on the path incurring a 1-ms delay at each switch after the message has been completely received. Assume switches introduce no delay to data traversing a circuit. You may also assume that file size is a multiple of 1000 bytes.
   1. For what file size n bytes is the total number of bytes sent across the network less for circuits than for packets?