CSCI 4171 Networks and Communications
CSCI 6704 Advanced Topics in Networks
Fall 2024
Assignment No. 3
Date Given: Tuesday, October 8, 2024
Date Due: Monday, October 21, 2024, 11.59 PM on Brightspace

This assignment has questions from Module 3: CRC

Submission: One ZIP file uploaded on Brightspace. Please see instructions at the end of this assignment.

Submission Deadline: Monday, October 21, 2024, 11.59 PM

Grace Time: Submissions will be accepted until 4.59 AM on Tuesday, October 22, 2024 without late penalty.

Late Penalty: Submissions received after the grace time will be subject to a 10% per day late penalty, for up to 5 days. For example, if you submit the assignment on Tuesday, October 22 at 12 noon and your score is 8/10, it will be reduced to 7.2/10. Submissions past five days after the grace submission time will not be accepted. The submission portal will close on Sunday, October 27, 4.59 AM.

Dropping of Assignments: One out of six assignments can be dropped during the semester. No SDA submission required.

1. <CRC Warm-up Exercises>

a) The message M(x) is a 12-bit sequence 110100111101, and the generator polynomial G(x) is 1011. What is the transmitted bit string? Show all steps.

b) The data string received by a receiver is 10110011101. If the generator polynomial G(x) is 1001, is there an error in the data unit? Show all steps.

2. <CRC Simulation> Write a program to simulate the sending and receiving parts of the CRC by implementing functions/methods for each of the following:
a) A method accepts a given bit string and the generator polynomial in binary, computes the CRC remainder and returns the bit string to be transmitted.
b) A method that accepts a given bit string (with the remainder appended) and the generator polynomial in binary, and determines if the message is error-free.

Use the above functions/method that you developed in (a) above in a client (test) program that accepts from the user input values of G(x) and the message M(x), and determines the transmitted message P(x).

You can implement either the long division or the shift register version.

You may use Java, C, C++ or Python for programming.

3 <Study of Error Detection Capability of CRC>. Use the program in Question 2 above to run the following experiment. Use the standard CRC-32 generator polynomial. Generate a random binary number of 1520 bytes. Find the remainder (4 bytes). Now introduce a random burst error of length = 32 bits in the frame of 1524 bytes. Check to see if the error is detected.
Repeat the above experiment a 50 times for burst errors of varying length > 32 bits. Determine how many times the errors are detected. Tabulate your results in a table similar to the one shown below:

Experiment No.	Burst error length	Error detected? (Yes or No)

Note on submission: For all programming questions, please submit the source codes as separate files so that TAs can run them. The source codes must not be cut and pasted into a text document.

Submit one zip file containing answers to Question 1, source codes and sample inputs/outputs for Question 2, and source code and the table for Question 3.