CARLETON UNIVERSITY
School of Computer Science

COMP3203– Principles of Computer Networks
Assignment 5

Instructor: Prof. AbdelRahman Abdou

Winter 2022

The assignment is **worth 3.64%** of the total course grade. It is graded out of 27, so your mark will be scaled accordingly.

You should submit a PDF document with your solutions in the respective assignment dropbox on cuLearn. For example, if you use MS Word, save it as PDF and upload. Name the PDF file as:

"A#_FirstName_LastName_StudentNumber.pdf"

So if John Smith, whose number is 123456789, is uploading the solution for Assignment 3, John should name the file "A3_John_Smith_123456789.pdf".

Make sure you upload your solution before the deadline, which is at **11:59pm EST on Apr 6th**. As usual, feel free to ask questions on our Brightspace forum.

Distribution of Marks

Question	Points	Score
1	14	
2	13	
Total:	27	

1. Suppose six active nodes—nodes A, B, C, D, E, and F—are competing for access to a channel using slotted ALOHA. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p. The first slot is numbered *Slot 1*, the first is numbered *Slot 2*, and so on.
   (a) (3 points) What is the probability that node C succeeds for the first time in Slot 4?
   (b) (4 points) What is the probability that some node (either A, B, C, D, E, or F) succeeds in Slot 7?
   (c) (4 points) What is the probability that the first success occurs in Slot 1?
   (d) (3 points) What is the efficiency of this 6-node system?

2. Let's consider the operation of a learning switch in the context of a network, in which five nodes labelled A through E are star-connected into an Ethernet switch. Suppose that (i) A sends a frame to B, (ii) B replies with a frame to A, (iii) C sends a frame to A, (iv) A replies with a frame to C. The switch table is initially empty.
   (a) (6 points) Show the state of the switch table before and after each of these events.
   (b) (7 points) For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answer.