COMP 3203 - Assignment #6

Due: Wednesday, December 3, 2025 at 11:59 pm

Grade: This assignment is out of 25 marks.

Collabortion: You must work individually.

Submission: You must submit your detailed solutions in a PDF-format file in *Brightspace*.
       You must show **every step** of your solution.

1. [10 marks] In the IEEE 802.11 WiFi protocol:

   a. [2 marks] Describe the role of beacon frames.

   b. [2 marks] Describe how the RTS threshold works.

   c. [4 marks] Suppose the IEEE 802.11 RTS and CTS frames were as long as the standard DATA and ACK frames. Would there be any advantage to using the CTS and RTS frames? Why or why not?

   d. [2 marks] What are the differences between a primary device in a Bluetooth network and an access point in an 802.11 network?

2. [15 marks] In wireless communications, the hidden terminal problem is when two devices cannot hear each others' transmissions because of an obstacle between them. We use ACKs, DIFS/SIFS, and (optional) RTS/CTS techniques in 802.11 to address this and other wireless problems.

   Suppose an 802.11b device is configured to use RTS/CTS, and it wants to send a 1500 byte frame to the access point. All other devices are idle at this time, and an ACK frame is 38 bytes long. Ignoring propagation delays, calculate the time required to transmit the frame and receive the acknowledgement.

   Here is some useful information for 802.11b:
   * DIFS is 50 μs (i.e. microseconds, or 10^{-6} seconds)
   * SIFS is 10 μs
   * RTS frame size is 20 bytes
   * CTS frame size is 14 bytes
   * Transmission rate is 11 Mbps