



## Wireless Networking aka “Wireless for IoT Class”

Course code: CS4222/CS5422

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## TUTORIAL 6 for WEEK 10 (Starting 13th March 2023)

[1] **Question 1:** Is TDMA a good choice for IEEE 802.11 (or WiFi)?

[2] **Question 2:** Four 802.11 stations share a single channel. The four stations have different link rates, namely 2Mbps, 20Mbps, 50Mbps and 100Mbps. The standard 802.11 CSMA/CA MAC protocol with BEB is used.

- What is the average throughput if all four stations always have packets to transmit?
- What is the average throughput if the protocol used (not CSMA/CA) ensure that all stations are given same amount of time to transmit?

[3] **Question 3:** 5 nodes (A, B, C, D and E) forms a straight line. The distance between the nodes are such that neighbouring can communicate but transmissions from nodes further away cannot be received. For example, A and B can communicate, but A and C cannot. Similarly, C and D can communicate, but B and D cannot. The nodes perform carrier sensing follow by RTS/CTS before data is transmitted.

- If node A is transmitting to node B, which other pair(s) of nodes can communicate at the same time?
- If node B is transmitting to node C, which other pair(s) of nodes can communicate at the same time?

- Assume that node A is sending data to station E through nodes B, C, and D. All transmissions rates are 11Mbps and RTS/CTS is used. What is maximum throughput achievable? Explain your answer.

[4] **Question 4:** Two mobile nodes (A and B) communicate using B-MAC. By default, a node performs preamble sampling every 1s for a 1ms interval. In addition, node A wakes up every 100s and sends a small packet to mote B. Assume that each node is equipped with a battery with lifetime of 2300mAhr. Transmission draws 20mA and receiving or idle listening draws a current of 10mA. You can assume that processing and sleeping do not consume energy.

- How long can node A run before the battery is completely depleted?
- How long can node B run before the battery is completely depleted?
- Consider the case where there is an additional node C and node A can transmit to either node B or node C (no change in A's transmission rate). Will the lifetimes computed (in parts a and b) for nodes A and B change? Explain your answer.

[5] **Question 5:** For each of the following applications, explain what is the most appropriate MAC protocol that should be used. Explain your choice.

- Web browsing
- VoIP
- Low rate control traffic and carrier sensing is not performed.