National Taiwan Normal University
Department of Computer Science and Information Engineering

CSC0056 - Data Communication

Homework 3

(Due on 11/25/2019, 9:10 AM. Submit your answer via Moodle)

1. (100 points) Answer the following review questions for Lecture 11. Each review question is a statement for you to judge whether it is true or not, according to the materials covered in the lecture and the textbook Section 4.2. If you think the statement is true, answer 'T'; otherwise, answer 'F' and provide your reason:

   Statement 1 (10 points): The free-for-all type of multiaccess communication, compared with the scheduled one, takes less setup effort for new senders to join the communication network (For example, in Internet-of-Things applications where additional cameras are used to expand the coverage of the area of interest).

   Statement 2 (10 points): In the slotted Aloha protocol, the *backlogged* nodes are those which have pending data items that were not sent successfully in the previous time slot(s).

   Statement 3 (10 points): In the slotted multiaccess model, we say a *collision* happened if more than one sender were sending data in the same time slot.

   Statement 4 (10 points): The no-buffering assumption states that a newly arriving packet at a node will be discarded if the node already has data (packet) that has not yet been transmitted successfully.

   Statement 5 (10 points): The $m=\infty$ assumption provides a way to analyze the lower bound of the delay that can be achieved with a finite number of nodes.

   Statement 6 (10 points): When analyzing the slotted Aloha, we may consider data re-transmissions as part of the overall data arrivals to the system, where we denoted the overall data arrival rate as G.

   Statement 7 (10 points): In the slotted Aloha with the same probability of re-transmissions for all nodes, the maximum achievable departure rate is about 0.368.

   Statement 8 (10 points): For stability analysis of the slotted Aloha, a positive value of *drift* implies that the system will have a decrease in the number of backlogged nodes.

   Statement 9 (10 points): In the slotted Aloha, as the system started having more and more backlogged nodes, initially there will be an increase in departure rate because the effect of contention between sending nodes is still outweighed by the effect of better utilization of time slots.

   Statement 10 (10 points): Following statement 9, eventually there will be a decrease in departure rate because the system will be overwhelmed by the increasing need for data re-transmission.