

Code A

Quiz 3 : 10 points (45 min)

March 28, 2012

0. Write down the code of your question paper next to your roll number. [0 points]
1. In a system implementing the ALOHA protocol, frames transmissions by distinct nodes arrive at a single destination at the following time instants: 0s, 0.75s, 2.5s, 4s and 5s. Suppose frame corruption occurs only due to collisions and not due to channel noise. Even slight collision between frame transmissions causes corruption of all frames involved in the collision. If only one frame is successfully received, what values can the frame duration T_f take? Assume all frames have equal duration. [2 points]
2. In a system implementing the slotted ALOHA protocol, distinct nodes have a frame to transmit at the following time instants: 0s, 0.5s, 1.5s and 2.5s. Assume that the time slots for all the nodes are synchronized and that the propagation delay is negligible. Suppose frame corruption occurs only due to collisions and not due to channel noise. If all the frames are successfully transmitted, what values can the frame duration T_f take? A frame duration value is valid if there is at least one synchronization configuration which allows all the frames to be successfully transmitted. [2 points]
3. A learning bridge has three ports A, B and C. Each port is connected to a LAN with two nodes. A1 and A2 are the nodes on the LAN connected to port A, B1 and B2 are on the LAN connected to port B and C1 and C2 are the nodes on the LAN connected to port C. Assume that the station caches of all the ports are empty. What happens when the following events occur in sequence?
- (a) A1 transmits a frame destined for A2.
 - (b) A1 transmits a frame destined for B2.
 - (c) C1 transmits a frame destined for B1.
 - (d) B1 transmits a frame destined for A1.
 - (e) B2 transmits a frame destined for C1.
 - (f) B1 transmits a frame destined for B2.
- [3 points]
4. Consider an IEEE 802.11 network consisting of three mobile nodes and a base station (BS) as illustrated in Figure 1. Let the current state of the network be given by the following conditions.
- (a) Suppose all the nodes are within transmission range of each other.
 - (b) Suppose both PCF and DCF are simultaneously being used in the network.
 - (c) Suppose nodes X and Y have successfully exchanged an RTS and CTS (with X sending the RTS).
 - (d) Suppose the base station wants to send a single polling message to node Y asking it if it has any frames to send. Suppose Y has no frames to send but it will send an ACK in response to the polling message frame.
 - (e) Suppose node Z wants to send a single unfragmented frame to node X using DCF.
 - (f) Suppose X wants to send two frame fragments to Y, i.e. two fragments which need to be reassembled at the destination to make a single frame.
 - (g) Suppose that the channel conditions are such that none of the transmissions are corrupted.

Draw the timing diagram illustrating the sequence of transmissions occurring in the network after the RTS/CTS exchange between X and Y. Be sure to indicate the different inter frame spacings between transmissions. Label the frames to indicate which node is sending it and which node is the intended destination. [3 points]

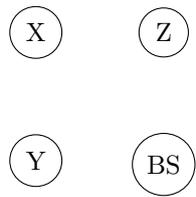


Figure 1: An IEEE 802.11 network consisting of three mobile nodes X, Y, Z and a base station