1) A pair of nodes A and B close to each other is sending packets to node C using IEEE 802.11 DCF. Both nodes A and B have many packets pending for node C. Show on a timing diagram the sequence of events that occurs until each of nodes A and B has received ACK for their 1st packet sent to C or we exhaust the backoff sequence (whichever earlier). Assume that they pick their successive backoff intervals as follows:
Node A: 3, 7, 5, 6, 2
Node B: 3, 8, 6, 2, 7
Assume that the propagation delay is negligible, and that the two nodes choose their initial backoff exactly at time t0, and that at time t0 channel changes status from busy to idle, because node D completes a transmission. In your timing diagram, show one timeline each for hosts A, B and C. In the timeline, show the various packets sent by the hosts, and backoff slots counted by the hosts. Also, if a packet transmission results in a collision, indicate that as well. Assume that RTS/CTS are sent prior to Data and ACK, and that in the absence of a collision, all transmissions are received reliably. 802.11a: slot time 9 us, RTS, CTS, ACK transmission time is around 61 us. (3 points)

2) Repeat the question (1) when A and B are hidden terminals and RTS/CTS is not used. (3 points)

3) In IEEE 802.11, a node retransmits a packet if the previous transmission of the packet is unsuccessful. A limit is imposed on the number of retransmissions. If the number of retransmissions equals this limit, and yet no acknowledgement is received, the packet is dropped. What is a potential disadvantage of using a very large upper bound on the number of retransmissions of a given packet? What is a potential disadvantage of using a very small upper bound on the number of retransmissions of a given packet? (2 points)

4) Why using RTS/CTS to address hidden terminals? IEEE 802.11 has RTSThreshold, which specifies the packet size over which RTS/CTS should be used (e.g., if RTSThreshold = 100 bytes, then all packets smaller than 100 bytes do not use RTS/CTS; all the packets100 bytes or larger use RTS/CTS). What are the advantage and disadvantage of using small RTSThreshold? Can RTSThreshold be smaller than RTS frame size? Why or why not? (2 points)

Bonus question: Repeat the question (1) when A and B are hidden terminals but RTS/CTS is used. (2 points)