Solutions to Assignment 6

Problem 1

1.a) Option 2:   1 message/2 slots

1.b) Option 4:   2 messages/slot

1.c) Option 3:   1 message/slot

1.d.a) Option 3:   1 message/slot

1.d.b) Option 4:   2 messages/slot

1.d.c) Option 4:   2 messages/slot

1.e.a) Option 1:   1 message/4 slots

1.e.b) Option 3 :   2 messages/ 3 slots

Scheme:
Slot 1: message A→ B, message D → C
Slot 2: ack B → A
Slot 3: ack C → D
This gives 2 messages/3 slots

1.e.c) Option 3 :   2 messages/ 3 slots

Scheme :
Slot 1: message C → D
Slot 2: ack D → C, message A → B
Slot 3: ack B → A

Problem 3

Option 4 : *DIFS + 3SIFS + 1547 μs*

A frame without data is 32 bytes long. Assuming a transmission rate of 11 Mbps, the time to transmit a control frame (such as an RTS frame, a CTS frame, or an ACK frame) is $\frac{256\ bits}{11\ Mbps} = 23$ μs. The time required to transmit the data frame is $\frac{2000\times 8 bits + 256\ bits}{11\ Mbps} = 1478$ μs. The total time is then:

$$DIFS + RTS + SIFS + CTS + SIFS + FRAME + SIFS + ACK$$
$$= DIFS + 3SIFS + (3\times 23 + 1478)\ \mu s = DIFS + 3SIFS + 1547\ \mu s$$

Problem 4

Option 5: No, but if wireless stations in different APs send at the same time, there will be a collision.

The two APs will typically have different SSIDs and MAC addresses. A wireless station will associate with one of the SSIDs (that is, one of the APs). After association, there is a virtual link between the new station and the AP. Label the APs AP1 and AP2. Suppose the new station associates with AP1. When the new station sends a frame, it will be addressed to AP1. Although AP2 will also receive the frame, it will not process the frame because the frame is not addressed to it. Thus, the two ISPs can work in parallel over the same channel. However, the two ISPs will be sharing the same wireless bandwidth. If wireless stations in different ISPs transmit at the same time, there will be a collision. For 802.11b, the maximum aggregate transmission rate for the two ISPs is 11 Mbps.