Rajat Sethi – ECE 4380 – HW 4

1.)

Odds of Host B not taking slot 1 = 1 - $1/(2^2)$ = 3/4

Odds of Host C not taking slot 1 = 1- $1/(2^3)$ = 7/8

Odds of Host D not taking slot 1 = 1 – $1/(2^4)$ = 15/16

Odds of all these events happening = 3/4 * 7/8 * 15/16 = 315/512

2a.)

The RTT is a 500-bit transmission, which is faster than the total 576 bits that A needs to transfer. Since A gets B's message before it finishes, a collision occurs on both ends, which means both need to send a jamming sequence. Had A received B's jamming message after it already transmitted, A wouldn't experience a collision on its own end and won't send its own jamming sequence back to B.

2b.)

Host A finishes sending its jamming sequence at 532 bits (500-bit RTT + 32-bit jam) or 53.2 microseconds.

Host B finishes sending its jamming sequence at 346 bits (250-bit delay + 64-bit preamble + 32-bit jam) or 34.6 microseconds.

2c.)

Host A becomes idle again at 596 bits (500-bit RTT + 64-bit preamble + 32-bit jam from Host B) or 59.6 microseconds.

Host B becomes idle again at 782 bits (500-bit RTT + 250-bit delay + 32-bit jam tx) or 78.2 microseconds.

2d.)

Host A becomes idle again (again) at 170.4 microseconds (596-bit first collision + 512-bit wait + 596-bit second collision)

Host B becomes idle again (again) at 182.6 microseconds (782-bit first collision + 512-bit wait + 500-bit RTT + 32-bit jam tx).

2e.)

In this scenario (A transmits immediately while B waits), **the transmission is successful.** B receives the first bit of A's message at 195.4 microseconds while B is still on the wait period (which ends at 233.8 microseconds). As such, a collision doesn't happen.

3a.)

Host A becomes idle again at 196 bits (100-bit RTT + 64-bit Preamble + 32-bit Jam) or 19.6 microseconds.

3b.)

Host B becomes idle again at 182 bits (50-bit original wait + 100-bit RTT + 32-bit jam) or 18.2 microseconds.

3c.)

Host C becomes idle again at 296 bits (200-bit original wait + 64-bit preamble + 32-bit jam) or 29.6 microseconds.

3d.)

Host A's retransmission is successful, as A's signal hits B before B has a chance to send its own package.

4a.)

x/y (Transmission Time) = 2 * (d / c) (RTT)

(cx / 2y) = d

4b.)

(x + e)/y (Transmission Time) = 2 * (m / c) (RTT)

c(x+e)/2y = m

4c.)

s + (x+e)/y (Transmission + Idle Time) = 2 * (n/c) (RTT)

c(s/2 + (x+e)/2y) = n

5.)

When a terminal sends a signal, it could interfere with the other terminal even though it does not intend to. This ends up creating a situation like the "exposed terminal problem."

6.)

Nodes 6, 7, 8, and 9 are allowed to send RTS's, as they did not receive the Node 1 RTS or Node 2 CTS.

7.)

The minimum signal coverage should be 2 * root(2) * r meters. This will cover the distance from the two diagonals of the ad hoc square.

8a.)

No, the hidden terminal problem does not occur, as a terminal can send a signal to a node R away, and a node 2R away would be able to sense that signal.

8b.)

Yes, the hidden terminal problem does occur since a terminal can send a signal to a node 2R away, and a node 4R away would not be able to sense that signal.