1. How "wide" is a bit on a 5-Gbps link? How long is a bit in copper wire, where the speed of propagation is 2.3×10^8 m/s? 10 + 10 = 20 pts

1Gb = 10^9 bits
10^-9 = 1 ns wide

1 ns * 2.3x10^8
=2.3x10^-1
=0.23m

2. How can a wireless node interfere with the communications of another node when the two nodes are separated by a distance greater than the transmission range of either node? – 10 points

If we have node 1 and node 3 while node 2 is between and has communications with both other nodes. So, node 1 and node 3 don't know of each other's existence, so since they are so closely related if node 3 transmits a signal, it will interfere with node 1's signal.

3. What kind of problems can arise when two hosts on the same Ethernet share the same hardware address? Describe what happens and why that behavior is a problem. – 10 points

If two hosts share the same hardware address will be seen as the same host to all other hosts. This means that all of their activities must coordinate, or else this can lead to a communication failure or breakdown.

4. In the absence of any packet losses or duplications, explain why it is not necessary to include any "sequence number" data in the packet headers. 10 pts

It is not necessary because the order can be determined with which the packets arrive to the receiver, sequence numbers are needed when packet loss ad duplications can occur so that the receiver may decode and know the correct order.

5. Compute no of bits required for sequence numbering when delay*bandwidth product is 1 MB and each packet is 512 Bytes (Assume to use the bandwidth in full capacity). – 10 pts

1Mb/512 Bytes * 8bits = (1* 10^6)/(512*8)=244.14 packets/s
Round up to 245
Log2(245) = 8 Bits

6. Draw a timeline diagram for the sliding window algorithm with SWS = RWS = 3 frames, for the following situation when Frame 4 is lost. Use a timeout interval of about 2 × RTT. – 10 pts