UNIVERSITY OF CALIFORNIA, LOS ANGELES

*CS M117*

**Homework #1**

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| *1A* | *1B* | *1C* | *1D* | *1E* | *1F* |
|  |  |  | *X* |  |  |

**Data Transmission over 802.11b Wireless LAN**

**Maximum total points [20]**

1. **[2]** Are RTS and CTS used with short packets, even if there is a hidden terminal situation?

in the given time period regardless of traNo. It is because even there is hidden terminal, the collision can occur less frequently when the package is shorter than RTS. The other reason is that sending shorter package itself is much easier than using RTS and CTS with it.

**2. [2]** Should we still use the Contention Window and Binary Backoff with short packets? Explain?

Yes. Because having short package, we may have a collision and it may cause not to reach data on the given period of time. Using Contention Window and Binary Backoff make data to reach in the given time period regardless of network traffic.sn time period regardless of network traffic.ow and Binary Backoff make data to reac

**3. [2]** Why can a new packet that senses the medium idle go off without using the Contention Window (see class slide: “direct access if medium is free”)?

hIn the medium idle the new packets can gain access freely because it is free to communicate without using the Contention Window. However, using Contention Window can cause data delays unnecessary when retramitting.sdKB. It cs 2KB. It cs 2KB. It cs 2KB. It ca

**4. [2]** To deal with this problem 802.11, when many users are located in the same area, and use the same wireless LAN at the same time, what access methods are defined to supports two modes of operations?

1. MAC-DCF CSMA/CA (mandatory)
   1. Is a physical channel sensing, collision avoidance via randomized back-off mechanism, and minimum distance between consecutive packets
2. MAC-DCF w/RTS/CTS
   1. Physical and virtual channel sensing, Distributed Foundation Wireless MAC, and avoids hidden terminal problem

**5. [2]** Consider the effect of using slow start on a line with a 10-msec round-trip time and no congestion. The receive window is 24 KB and the maximum segment size is 2 KB. How long does it take before the first full window can be sent?

Given that the maximum segment size is 2KB, it can be interpreted that we can send double KB the size of segment namely 4KB of 2 segments, 8KB of 4 segments, 16KB of 8 segment and 32KB of 16 segments. Hence, we have total of 4RTTs. Thus total time is 4 \* 10 msec = 40msec

It means that we can send full first window after 40 msecil

**6. [2]** Given a channel with an intended capacity of 20 Mbps. The bandwidth of the channel is 3 MHz. What signal-to-noise ratio is required in order to achieve this capacity?

ilShannon Capacity Theorem = (C) = B \* log2(1+S/N)

20Mbps = 3MHZ \* log2(1+S/N)

=> S/N = 100.6

Hence, 100.6 signal-to-noise ratio is required in order to achieve this capacity.

**7. [2]** What is the channel capacity for a tele-printer channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3dB?

ys Channel Capacity (C) =

300 \* log2(1 + 2)

= 474bps

**8. [1]** What really means an idle state?

Idle state seems vague, But if I relate it to the lecture note on CSMA/CS processing, it would be

1. It waits for a specified time Distributed Inter Frame Space
2. If no other station transmit, then it will transmit a short RTS
3. The Access Point responds with a response control packet called CTS

**9. [1]** Five channels, each with a 100-KHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 KHz between the channels to prevent interference?

The minimum bandwidth we require = 5\*100 + 2\*10 = 540kHznne

**10) (a) [0.5]** List the three different modes of multipath signal propagation (besides direct signal) and the cause for each of these modes.

**(b) [1]** What kind of signal reception problems these different modes cause?

essary when retramitting.(a) Solution:

1. Diffraction: wavelength obstruction caused by a sharp edges surface
2. Reflation: Wavelength obstruction is caused by surfaces that is larger than wavelength
3. Scattering: Wavelength obstruction is caused by the surface that is smaller than wavelength

(b) Solution:

1- Diffraction: It can cause the small-scale fading

2- Reflation: It can cause large scale fading

1. Scattering: It can cause small scale fading

**11) [0.5]** What is frequency range of 802.11b Wireless Channel?

The range of 802.11b Wireless Channel frequency is from 2.4GHZ to 2.4835GHZ

**12). [2]** Multipath fading is maximized when the two beams arrive 180 degrees out of phase. How much of a path difference is required to maximize the fading for a 50-km-long 1-GHz microwave link?

The light formula we know

C = f \* wavelength

wavelength = c/f = 3\*10^8m/s /1\*10^9s^-1 = 30cm

Now,

For 180 degrees out of phase, the path difference is = 30cm/2 = 15cm i.e. 0.15m