EECS 562

Homework 14

1. (Concept: CP) As the channel delay spread increases the the length of the cyclic prefix increases. True or False
2. (Concept: Carrier synchronization) How is carrier synchronization achieved in OFDM systems?
3. (Concept: Determining Δf in OFDM given channel properties) A multipath fading channel response approximately constant over 33.3μs? What is an appropriate subchannel spacing for an OFDM system.
4. (Concept: TDMA) LTE uses only TDMA, TRUE or FALSE
5. (Concept: relationship between symbol time and Δf in OFDM) In WiFi 7 OFDM systems the symbol time is 12.8 μs sec. Why is the spacing between the subcarriers must be 78.125 kHz?
6. (Concept: OFDM bit rate) To deploy their LTE system a telecommunications company has leased 13.515 MHz of occupied bandwidth which supports 901 downlink subcarriers. Assume that every subcarrier uses 64-QAM. What is the downlink bit rate in Mb/s?
7. (Concept: Dynamic OFDM bit rate assignment) When an LTE operator uses a 20 MHz channel bandwidth in the downlink there are 1200 occupied subcarriers. In LTE the OFDM symbol time, T=1/15000 sec with a subcarrier separation of 15kHz.
    a. If all 1200 subcarriers use 64-QAM what is the total bit rate of in Mb/s.
    b. If all 1200 subcarriers use 256-QAM what is the total bit rate of in Mb/s.
8. (Concept: Information exchange for AMC) What is CSI?
9. (Concept: Value of ACM) What is AMC?
10. (Concept: OFDM bit rate calculations) All the OFDM symbols in an RB are is assigned the same modulation format. Each RB has 12 subcarrier with 7/symbols/subcarrier. Calculate the bit rate in (kb/s) for an RB with the following modulation assignments,
    a. QPSK
    b. 16-QAM
    c. 64-QAM
11. (Concept: Resource Blocks) How many RBs are available with a 20MHz channel assignment.
12. (Concept: Factors determining the length of the CP) The normal CP in LTE is 4.7μs while in WiFi 7 the standard CP (in WiFi the CP is called a Guard Interval - GI) is 0.8μs. Why do these systems use different CP lengths?