CSC8360 S2 2022 Practice 3[ANSWERS]

**RF Fundamentals** Due Date: xx/xx/2022

**Practice Question 1:**

What are the components that form a wireless network?

[ANSWER: ]

**Practice Question 2:**

What are various considerations needed to be taken into account when planning a wireless network.

ANSWER:

* *The area to be cover is to be assessed (localized or widespread coverage)*
* *Number of connected users (fixed or mobility or both)*
* *Access network performance (uplink and downlink speeds, latency)*
* *Quality of Service (QoS)*
* *Security requirements* 
  + *Infrastructure Protection,*
  + *Information/Data Protection,*
  + *Authentication, Authorization and Accounting (public, private, guest access control)*
* *Accessibility (connection to the internet or intranet or both)*
* *Resilience (fault tolerant, removal of single points of failure)*
* *Frequency band (higher frequencies support greater bandwidth but limited coverage versus lower frequency bands provide wider coverage but the*
* *Wireless network equipment placement (maximize coverage with minimal wireless locations)*

**Practice Question 3:**

Describe the impact of selecting higher frequency bands over lower frequency bands.

ANSWER:

* *Higher frequency bands are capable of supporting greater bandwidths,*
* *Higher frequency bands cover lesser ranges,*
* *Equipment operating at higher frequency bands typically are more compact (smaller form factor),*
* *Higher frequency bands are more impacted by obstructions in the path (line of sight requirements)*

**Practice Question 4:**

Describe the impact of multi-path signals (reflected and/or refracted) reaching the receiver of a wireless network access point and what measures can be used to reduce the impact of these signals.

ANSWER:

**Practice Question 5:**

Using Shannons Law, calculate the maximum theoretical data rate for a cellular wireless connection where the channel bandwidth is 20MHz, the Signal Power Level is 50 watts and the Noise Level is 0.5 watts. Use “R” software to calculate and plot the maximum theoretical data rate for this example where the Noise Level ranges from 0 watts to 50 watts.

ANSWER:

# Shannon's Formula --> C = W log2(1 + S/N)

# where C = Maximum Achievable Data Rate (in bit/second, to be converted to Mbit/s)

# where W = Radio Channel Bandwidth (in hertz)

# where S = Signal Power Level (in watts)

# where N = Noise Level (in watts)

# Note that S/R = Signal Noise Ratio or Signal Quality

W = 20000000

S = 5.0

N <- 1:50

C <- (W\*log2(1 + S/N))/1000000

C

plot(C, xlim=c(1,55), ylim=c(1,55),

xlab = "Noise Level (watts)",

ylab = "Data Rate (Mbps)")

lines(x=N, y=C)

