**CSC 335 Data Communications and Network I**

**Homework 2**

1. (1 point) Unshielded twisted pair (UTP) and shielded twisted pair (STP) are two common communication medium. Please identify the pros, cons, and usage examples for each communication medium.

**One of the main differences comes from the name, as STP is a twisted pair of wires that are shielded. The shielding reduces electromagnetic interference (also known as crosstalk), so STP has higher transmission rates. However, UTP is the more economical option. It is cheaper and lighter than STP. STP should be used in larger facilities (hospitals, airports, large offices) since there are so many cables running parallel, the crosstalk has to be avoided. UTP is better for smaller buildings (small offices, homes) since there likelihood of multiple cables running parallel to each other is low, and crosstalk is not a prevalent issue.**

1. (1 point) Assume you need to get a signal composed of frequency ranging from 300 Hz to 3000 Hz. What is the bandwidth of this signal? What filter will you use to get this signal?

**The bandwidth of the signal would be 2700hz, or 2700 times per second. The filter used would be a bandpass filter, it would filter out any signals lower than 300hz and any signal greater than 3000hz.**

1. (1 point) Modulation is the process of converting data into radio waves by adding information (varying its amplitude, frequency, phase, polarization) to an electronic or optical carrier signal. A carrier signal is one with a steady waveform – constant amplitude and frequency. For example, ATT 5G band is 850 MHz and Verizon 5G band is 1700-2100 MHz. They use different frequency to avoid interferences and noises. Although they use different carrier signals, both need to transmit human voice, text message, picture, video, etc. Therefore, they need to varying single amplitude, frequency, phase, and polarization for optical signal to send all these information. Modulation schemes can be categorized into analog and digital modulation. Please identify the difference between analog and digital modulation.

**In analog modulation, the amplitude of the signal continuously varies in time. Information is stored in the absolute signal level at every given point in time. Digital signals have a set number of amplitude values, and is more “linear” than analog since it is binary (has 2 levels). The information is stored in discrete, defined levels (positive or negative amplitude).**

1. (1 point) You may notice that there are two types of radio stations, AM and FM. AM means amplitude modulation and FM means frequency modulation. What are the main differences between the two modulation techniques? **Analog modulation has no discretization, and can take any continuous signal. In digital modulation, however, only discrete, well-defined signals are accepted, which is why the amplitude looks more linear while analog has more curvature.** Despite the differences, both AM and FM are analog modulation. Could you please identify one more analog modulation method? **Another type of analog modulation method with be phase modulation.**
2. (2 points) In digital modulation, you could also modify signal’s amplitude, frequency, and phase. What are the names of the technique that modify amplitude, frequency, and phase in digital modulation? Please explain one of the techniques in details. **ASK, FSK, PSK. Frequency Shift Keying (FSK) is a techniques used to increase the amount of frequency over a phase. The higher the binary input, the higher the frequency and vice versa for lower input.**
3. (1 point) As a fun of classic music, I listen to WRTI a lot. Please identify the frequency of WRTI and calculate the period of the signal.

**WRTI Philly is 90.1 FM (or mHZ). The frequency of this is 90,100,000 times per second. The period of this signal (1/90.1) is 11.1 ms.**