**Sir Syed University of Engineering and Technology**

**Department of Computer Science and Information Technology**

**CS-328 Data Communication and Networks**

**ASSIGNMENT 02**

**Max Marks: 10 Due Date: 31st March 2021**

**NOTE: ONLY HAND WRITTEN ASSIGNMENT WILL BE ACCEPTTED**

**Q#1: Review Questions (2-line answer)**

1. What is the relationship between period and frequency?
2. What does the amplitude of a signal measure? What does the frequency of a signal measure? What does the phase of a signal measure?
3. Name three types of transmission impairment.
4. Distinguish between baseband transmission and broadband transmission.
5. Distinguish between a low-pass channel and a band-pass channel.
6. What does the Nyquist theorem have to do with communications?
7. What does the Shannon capacity have to do with communications?
8. Can we say if a signal is periodic or non-periodic by just looking at its frequency domain plot? How?
9. Is the frequency domain plot of a voice signal discrete or continuous?
10. Is the frequency domain plot of an alarm system discrete or continuous?

**EXCERSISE QUESTIONS**

1. Given the frequencies listed below, calculate the corresponding periods
   1. 24Hz
   2. 8 MHz
   3. 140 KHz
2. Given the following periods, calculate the corresponding frequencies.
   1. 5 s
   2. 12 microsec
   3. 220 ns
3. What is the phase shift for the following?
   1. A sine wave with the maximum amplitude at time zero
   2. A sine wave with maximum amplitude after 1/4 cycle
   3. A sine wave with zero amplitude after 3/4 cycle and increasing
4. What is the bandwidth of a signal that can be decomposed into five sine waves with frequencies at 0, 20, 50, 100, and 200 Hz? All peak amplitudes are the same.Draw the bandwidth.
5. A device is sending out data at the rate of 1000 bps.
   1. How long does it take to send out 10 bits?
   2. How long does it take to send out a single character (8 bits)
   3. How long does it take to send a file of 100,000 characters?
6. A periodic composite signal contains frequencies from 10 to 30 KHz, each with an Amplitude of 10 V. Draw the frequency spectrum.
7. A non-periodic composite signal contains frequencies from 10 to 30 KHz. The peak amplitude is 10 V for the lowest and the highest signals and is 30 V for the 20-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum.
8. Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels. How maximum bit rate can be calculated?? Consider the same noiseless channel transmitting a signal with four signal levels (for each level, we send 2 bits). How the maximum bit rate can be calculated?
9. We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need?
10. Consider an extremely noisy channel in which the value of the signal-to-noise ratio is almost zero. In other words, the noise is so strong that the signal is faint. For this channel how the capacity C is calculated??
11. The attenuation of a signal is -10 dB. What is the final signal power if it was originally 5W?
12. A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000 KHz. What is the maximum data rate supported by this line?
13. We measure the performance of a telephone line (4 KHz of bandwidth). When the signal is 10 V, the noise is 5 mV. What is the maximum data rate supported by this telephone line?
14. If the peak voltage value of a signal is 20 times the peak voltage value of the noise, what is the SNR? What is the SNRdB?
15. What is the theoretical capacity of a channel in each of the following cases:
    1. Bandwidth: 20 KHz SNRdB =40
    2. Bandwidth: 200 KHz SNRdB =4
    3. Bandwidth: 1MHz SNRdB =20

**BEST OF LUCK**