

# CSE 963: Computer Networks I

## Homework 1 (50 points)

The goals of this homework are to develop an understanding a communications model, data communications, networks, protocol architecture as well as the basic concepts of data transmissions, data rate, bandwidth and channel capacity.

1. **(10 points)** Briefly explain the advantages and disadvantages of using layered architecture in computer networks.
2. **(10 points)** What tasks are performed by the data link layer and the transport layer?
3. **(10 points)** Draw (by hand) the spectrum of the signal  $s(t) = 4\sin(2\pi t) + 2\sin(6\pi t) + \left(8/\pi\right)\sin(7\pi t)$ . Also identify the absolute and effective bandwidths.
4. **(10 points)** What is the channel capacity for a teleprinter channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3 dB, where the noise is a white thermal noise?
5. **(10 points)** A digital signaling system is required to operate at 9600 bps. If the signal encodes a 4-bit word, what is the minimum required bandwidth of that channel?