

**Problem Set 1 (due September 22, 2003). [50 points]**

1. **(20 points):** Write a program that opens a UDP socket and allows two users to communicate by sending messages on some port *port\_number* (e.g., 1234). For examples of client and server socket programs you can refer to the following:

<http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/client-tcp.c>  
<http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/server-tcp.c>  
<http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/client-udp.c>  
<http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/server-udp.c>

If needed you can also get more information from various internetworking books such as: *“Computer Networks”, Peterson & Davie, Morgan Kaufmann Publishers.*

<pre>sunstation1&gt; chat sunstation2 1234  Hello  How are you?</pre>	<pre>sunstation2&gt; chat sunstation1 1234  Hello How are you?</pre>
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2. **(10 points)** describe the steps that your web browser goes through when accessing an html page such as: [www.ccs.neu.edu](http://www.ccs.neu.edu). Assume that your computer is connected to a LAN (Ethernet). You can gather such information from the web and general networking books.

**Hint:** Involved elements are TCP port #, DNS, html, ARP, Ethernet.

3. **(20 points):** Assume that a transmitter and a receiver are communicating over a channel such that the signal to noise ratio ( $S/N_0W$ ) is equal to 40dB. Assume that the channel bandwidth is 1 MHz.
- What is the maximum data rate that can be achieved with this communication?
  - Assume that the transmitter only needs to send (one-way) a packet of 1Kbytes every 1 millisecond. How much energy would the sender save by reducing its signal power and satisfying its packet transmission requirement?