1. You need to write a program which has to read from a number of different sockets. Which of the following design choices would be best from an efficiency standpoint and why?
   A. Make the sockets non-blocking and have the main thread poll them in order in a loop.
   B. Start a thread for each socket so that each thread will block in recv() until there is data available on that socket.
   C. Use the select() system call in the main thread to watch for any activity on the designated sockets (which you set with the macro FD_SET()).

2. What is the signal to noise ratio (S/N) and how is it quantitatively related to the maximum information one can get through a communications channel?

3. What advantages does a framed “self-clocking” encoding method with Manchester encoding have over asynchronous transmission of characters with level-sensitive encoding assuming that the bandwidth of the line is the SAME in each case?

4. If the tcp transport protocol were changed tomorrow to add additional end-to-end support features such as encryption of the data stream (or a 19-th version of Microsoft’s quoted-printable phony ascii character set) would it be necessary to change either the ip-datagram format or the ip-datagram routing protocol? Why or why not?

5. Short queries (like DNS-lookups for addresses and mail exchangers) typically use the udp protocol rather than the tcp protocol, even though data sent via udp is unacknowledged. Why is this done?

6. A certain private Ethernet LAN uses standard Dec-Intel-Xerox Ethernet where the Data Link Layer uses the binary exponential backoff algorithm to get a frame out on the wire without a collision. Assume, in addition, that binary exponential backoff always succeeds before the 16-th try on this LAN, so collisions are always recovered from. There is no connection to other outside networks like the Internet, and all connections are local.
   7a. Can we conclude that the ip-network layer is not supplying any essential function for this LAN (i.e. is the ip-network layer really being used)? Why or why not?
   7b. Can we conclude that the tcp-transport layer is not supplying any essential function for this LAN (i.e. is the tcp-transport layer really being used)? Why or why not?

7. If a machine is replaced by another machine with the same ip-address, it may happen that the first few connection attempts to it fail. What is the most likely cause for this?

8. What is the main difference between a bridge and a router?

9. In a Unix shell, is it possible to make all of the commands external? Why or why not?

10. Early versions of the Unix route daemon (routed) sat on udp port 520 and accepted any route information sent to them. This turned out to be a bad idea; why?

11. A user password is typically limited to 8 characters (alpha, digits, punctuation). The bits from the ascii codes are then used to form a 56-bit key for DES. DES allows $2^{56}$ possible keys but since users are limited to printable characters they can only get $95^8$ or approximately $2^{53}$ out of a possible $2^{56}$ keys. If it took 1 uSec to try every possible user key it would take almost 300 years. How is it possible to guess user passwords?

12. During a telnet session the telnetd sits between the socket and the shell and passes bytes back and forth. Why not eliminate the telnetd and have the shell read and write the socket directly?