1. (5pts) Briefly explain the difference between connection-oriented service and connectionless service.

2. (5pts) Explain how a protocol is different from a layer-to-layer interface.

3. (10pts) List the layers (in order) of the ISO/OSI Reference Model and give a one-sentence description of what each layer does.

4. (4pts) Give three reasons that TCP/IP is more widely used than ISO/OSI-based protocols.

5. (5pts) Briefly explain the difference between Propagation Delay and Transmission Delay.

6. (5pts) Explain why the standard interval between digital samples for a telephone voice circuit is 125usec instead of some other time interval.

7. (4pts) Explain the differences in the way that FDM and TDM operate.

8. (4pts) Explain how a modem can have a bit rate that is higher than its Baud rate.

9. (4pts) For voice traffic, a standard T1 line supports 24 channels. For data traffic, it only supports 23. Why is this?

10. (7pts) List the steps involved in setting up a circuit in a connection-oriented network.

11. (4pts) How is Routing different from Switching?

12. (4pts) How many switching elements are in a 16-input crossbar? A 16-input Banyan?

13. (8pts) Draw the TCP/IP "hourglass."

14. (4pts) For long-haul lines, optical fiber cabling is preferred over copper cabling. Give two reasons for this.

15. (5pts) List three things that SWA does that helps ensure network reliability.

16. (4pts) Why is "byte stuffing" sometimes needed to support data link protocols?

17. (4pts) How does the ARQ data link protocol support flow control?

18. (4pts) Match the following:

____ Simple Parity   a. Error correction

____ 2D Parity   b. Good for Burst Errors

____ Checksum   c. Uses Exclusive-OR of Data bits

____ CRC   d. Simple and fast for large blocks of data

19. (5pts) We want to develop a new Data Link protocol that is to be run on top of an arbitrary Physical-layer protocol. Why would we not want to use time-based frame synchronization in this case?

20. (5pts) For the new protocol of Problem 19, we eventually decide to use character counting to determine the start and end of frames. We also consider using special synch bytes to mark the start and end of the frame, but we decide that would result in excessive overhead. What is the problem with this design?