1.) In the past, a popular network model is the OSI (Open System Interconnection) network model proposed by the ISO (International Standard Organization). Compare between the TCP/IP and the ISO/OSI network reference models.

a.) What is a network reference model?

b.) Briefly describe the main difference between the TCP/IP and the ISO/OSI reference models. Be sure to describe the different layers in each model and the main functions that are in each layer.

c.) Why was the ISO/OSI model not appropriate for implementing very large computer networks? Give the main reasons.

2.) Consider the design of network systems, which are complex systems.

a.) How does modularization simplify the design and implementation of network systems?

b.) Even with modularization, network design could still encounter some serious problems. Briefly describe what serious problem could arise in network design and implementation with modularization.

c.) Describe how the problem in (b) can be solved in network design.

3.) Describe the two main functions of the network layer in the TCP/IP protocol stack. Also describe the details of how these functions work.

4.) When a packet is being forwarded by a router to another router in a network, there are often some delays. Describe what four of these delays are and what causes the delays. Show how these delays can be calculated or estimated.

5.) Figure 1 shows a sub-net, where there are three connections between the client and the server. Each connection consists of 5 links with transmission rates as shown in Figure 1. All connections use a shared backbone link, whose capacity of 45 Mbps is shared equally among the 3 connections.

a.) If the server can only use one connection to send to the client, what is the maximum throughput that the server can achieve?

b.) If the server can use all the parallel connections to send data, what is the maximum throughput that the server can achieve?

6.) What are the four main principles used in designing the TCP/IP Internetworking Protocol? Also, for each of these, explain why that principle is important for contributing to the successful implementation of an extremely large and complex Internet.