158.235 Tutorial – Network Layer

1. What does the network layer do?

2. Suppose a web browser sends an HTTP request, which is 100 bytes long. What is the percentage overhead introduced by TCP and IP headers in making the packet?

3. Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 5 million bytes? Explain how you computed your answer.

4. What is the difference between routing and forwarding?

5. Compare and contrast unicast, broadcast, and multicast messages

6. Describe how packet loss can occur at input ports. Describe how packet loss at input ports can be eliminated (without using infinite buffers).

7. Suppose there are three routers between a source host and a destination host. Ignoring fragmentation, an IP datagram sent from the source host to the destination host will travel over how many interfaces? How many forwarding tables will be indexed to move the datagram from the source to the destination?

8. Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When Host B receives the datagram, how does the network layer in Host B know it should pass the segment (that is, the payload of the datagram) to TCP rather than to UDP or to something else?

9. What is the Subnet portion of the IP address and what is the subnet mask for the following:
   a) 120.140.0.0/16
   b) 133.144.155.0/24
   c) 202.100.1.0/26

10. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

11. Compare and contrast link-state and distance-vector routing algorithms.

12. Determine the shortest path from router x to all the other routers using the link state algorithm (Dijkstra's algorithm)