1. What is the chief difficulty in providing universal service?  (4 pts)

Incompatibilities make it impossible to form a large network merely by interconnecting the wires among networks. Each technology, in a network, uses its own packet format and addressing scheme. A frame created for a network technology cannot be transmitted on a network that uses a different technology.

1. In the 5-layer reference model used with the TCP/IP Internet protocols, what is the purpose of each of the five layers? (10 pts)

Layer 1 (Physical): It specifies details about the underlying transmission medium and the associated hardware.

Layer 2 (Network Interface): This layer specifies details about communication between higher layers of protocols and the underlying network

Layer 3 (Internet): IP specifies the format of packets sent across the Internet, also specifies mechanisms used to forward packets.

Layer 4 (TCP): TCP specifies the message and provides procedures that are used to insure reliable transfer.

Layer 5 (Application): Protocols in the top layer of the TCP/IP stack specify how a pair of applications interact when they communicate.

1. If an ISP assigned you a /28 address block, how many computers could you assign an address?(4 pts)

Could assign to 14 computers since what is left from 28 address block is 2^4 which is 16 but cannot use all 1111 or all 0000. We can only from 0001 to 1110 therefore only up to 14 pcs.

1. Suppose you are an ISP with a / 24 address block. Explain whether you accommodate a request from a customer who needs addresses for 255 computers. (Hint: consider the special addresses.) (4 pts)

No, because what is left from a 24 block address is 8 bits and since 2^8 = 256 but we need to subtract all 0’s and all 1’s that leave us with 254 addresses available. Close but not quite.

1. Can a host have more than one IP address? Explain (4 pts)

Yes, it is call Multi-homing and it is sometimes used to increase reliability if one network fails the can still reach the internet through the second connection. It is also used to increase performance because multiple networks can make it possible to send traffic directly and avoid routers which are sometimes congested.

1. What are the two basic communication paradigms that designers consider when designing an internet?. (2 pts)

The two basic communication paradigms are TCP/IP stream paradigm and UDP message paradigm.

1. What term is used to describe the mapping between a protocol address and a hardware address?(3 pts)

Address resolution protocol, a host or router uses address resolution when it needs to send a packet to another computer on the same physical network, never on a remote network.

1. How many responses does a computer expect to receive when it broadcasts an ARP request? Explain.

It receives only one message back because only the pc that has the correct IP address and Mac address responds.

1. What is the chief purpose of NAT?

The goal of NAT is to provide an illusion that is, the site to appear to consist of a single host computer. All datagrams sent to the site appeared to be sent to one host and all datagrams from the site appeared to originate from one host. But, when viewed from the host is the site, the Internet appears to accept and route private addresses.

1. If a routing loop exists, which ICMP error message will be sent? Explain the process.

The datagram contains a TIME TO LIVE field used to prevent a datagram from circulating forever if the forwarding tables in routers incorrectly introduce a circular path. The error type incorporated will be Time Exceeded and the purpose is TTL expired or fragments timed out because datagram does not arrive before the reassembly timer expires.

1. Do applications control messages before exchanging data? need to exchange UDP Explain.

No UDP is different from TCP/IP where it does not need to establish a connection before exchanging data. It also does not inform the network when is done transmitting data. This means UDP can send data at any given time and stop it whenever it wants.

1. Calculate the size of the largest possible UDP message. (Hint: the entire UDP message must fit in an IP datagram.)

The largest sizes can be 1400 or 1450 octets to leave plenty of room for UDP and IP headers.

1. List the features of TCP.

Connection orientation, Point to Point communication, Complete Reliability, Full duplex communication, Stream interface, Reliable connection startup, and Graceful connection shutdown.

1. What is the chief cause of packet delay and loss in the Internet?

Congestion is the main cause of packet delay and loss. Even if switches temporarily stores packets in memory, congestion results in increased delay. If congestion persists, the switch will run out of memory and begin discarding packets.