

## Recitation 1

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1. Match the following to one or more layers of the OSI model:
  - a. reliable process-to-process message delivery
  - b. route selection
  - c. defines frames
  - d. provides user services such as email and file transfer
  - e. transmission of bit stream across physical medium
2. Which field is used for demultiplexing in the following protocol layers :
  - a. Data link
  - b. Network
  - c. Transport
3. Imagine the length of a 10BASE5 cable is 2500 meters. If the speed of propagation in a thick coaxial cable is  $2 \times 10^8$  m/sec, how long does it take for a bit to travel from the beginning to the end of the network? Ignore any propagation delay in the equipment. **[Redo for 100Tx Cat 5 twisted pair]**
4. Using the data in Exercise 3, find the maximum time it takes to sense a collision. The worst case occurs when data are sent from one end of the cable and the collision happens at the other end. Remember that the signal needs to make a round-trip.
5. An Ethernet MAC sublayer receives 42 bytes of data from the LLC sublayer. How many bytes of padding must be added to the data?
6. An Ethernet MAC sublayer receives 1510 bytes of data from the LLC sublayer. Can the data be encapsulated in one frame? If not, how many frames need to be sent? What is the size of data in each frame?
7. An address space uses three symbols: 0, 1, and 2 to represent addresses. If each address is made of 10 symbols, how many addresses are available in this system?
8. How many digits are needed to define the netid in hexadecimal notation in each of the following classes?
  - a. Class A
  - b. Class B
  - c. Class C
9. A host with an interface whose IP address is 128.23.67.3 sends a message to a host with an interface whose IP address is 193.45.23.7. Does the message travel through any router? Assume no subnetting.

10. A host having an interface whose IP address 128.23.67.3 sends a message to a host with an interface having the IP address 128.23.23.7. Does the message travel through any router? Assume no subnetting.
11. Draw a diagram of a network with address 8.0.0.0 that is connected through a router to a network with IP address 131.45.0.0. Choose IP addresses for each interface of the router. Show also some hosts on each network with their IP addresses. What is the class of each network?
12. A router has an interface whose IP address is 108.5.18.22. It sends a direct broadcast packet to all hosts in this network. What are the source and destination IP addresses used in this packet?
13. A host has an interface whose IP address is 108.67.18.70. It sends a limited broadcast packet to all hosts in this network. What are the source and destination IP addresses used in this packet?
14. A host with an interface whose IP address is 185.67.89.34 needs loopback testing. What are the source and destination IP addresses used in this packet?
15. A host with IP address of 123.27.19.24 sends a message to a host with IP address 123.67.89.56 using the "Specific Host on This Network". What are the source and destination IP addresses used in this packet?
16. A host in class C that does not know its IP address wants to send a message to a bootstrap server to find its address. What are the source and destination addresses?
17. Can we have an address such as x.y.z.t/32? Explain.
18. In a network, the address of one computer is 201.78.24.56 and the address of another computer is 201.78.120.202. How many addresses are in between? Hint: use the base 256 numbering system.
19. In a class C subnet, we know the IP address of one of the hosts and the mask as given below:
  - a. IP Address: 182.44.82.16
  - b. Mask: 255.255.255.192
  - c. What is the first address (subnet address)?
20. What is the maximum number of subnets in each case?
  - a. Class A; mask 255.255.192.0
  - b. Class B; mask 255.255.192.0
  - c. Class C; mask 255.255.255.192
  - d. Class C; mask 255.255.255.240

21. In a block of addresses, we know the IP address of one host's interface is 25.34.12.56/16. What are the first address (network address) and the last address (limited broadcast address) in this block?
22. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.
  - a. Find the subnet mask.
  - b. Find the number of addresses of addresses in each subnet.
  - c. Find the first and the last address in the first subnet.
  - d. Find the first and the last address in the last subnet (subnet 500).
23. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 1000 customers as follows:
  - a. The first group has 200 medium-size businesses; each needs 128 addresses.
  - b. The second group has 400 small businesses; each needs 16 addresses.
  - c. The third group has 2000 households; each needs 4 addresses.
  - d. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.
24. An ISP is granted a block of addresses starting with 120.60.4.0/20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 8 addresses only. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.
25. An ISP has a block of 1024 addresses. It needs to divide these addresses over 1024 customers, does it need subnetting? Explain your answer.