

CS 462: Assignment 5

1. Write two advantages and two disadvantages of Slotted ALOHA. 2
2. What is the function of ARP in link layer? 2
3. Switches and routers both share some similarities but do completely different tasks. Explain three differences between these two devices in the link layer. 2
4. Give two reasons why hubs are considered inferior to a switch or router? 2
5. Link layer and transport layer share some common functionalities; however, they are different. What is the basic difference between them. 2
6. Explain four services provided by the link layer. 2
7. Write the steps of the CSMA/CD algorithm implementation performed by Ethernet. 2
8. In CSMA/CD, after the fifth collision, what is the probability that a node chooses $K = 4$? The result $K = 4$ corresponds to a delay of how many seconds on a 10 Mbps Ethernet? 2
9. How big is the MAC address space? The IPv4 address space? The IPv6 address space? 2
10. Why would the token-ring protocol be inefficient if a LAN had a very large perimeter? 2
11. Suppose the information content of a packet is the bit pattern 1110 0110 10011101 and an even parity scheme is being used. What would the value of the field containing the parity bits be for the case of a two-dimensional parity scheme? Your answer should be such that a minimum-length checksum field is used. 4
12. What is the difference between a datagram and a frame? Perform a CRC on datagram $A = 10011001010$ using a CRC generator 1011. 4
13. To compute the Internet checksum, we add up the values at 16-bit quantities followed by a final one's complement at the end. Suppose you have the 8-bit unsigned binary ASCII representation of numbers from 1 to 10. These numbers are sequential. What will be your Internet checksum for this data? 4

14. Let's consider the operation of a learning switch in the context of a network in which 6 nodes labeled A through F are star connected into an Ethernet switch. Suppose that (i) B sends a frame to E, (ii) E replies with a frame to B, (iii) A sends a frame to B, (iv) B replies with a frame to A. The switch table is initially empty. Show the state of the switch table before and after each of these events. For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answers. 4

15. In this problem, you will put together much of what you have learned about Internet protocols. Suppose you walk into a room, connect to Ethernet, and want to download a Web page. What are all the protocol steps that take place, starting from powering on your PC to getting the Web page? Assume there is nothing in our DNS or browser caches when you power on your PC. Explicitly indicate in your steps how you obtain the IP and MAC addresses of a gateway router. 4