CpE 319 Winter 2004 Exam 3 Name _____

Show all work on the exam sheets; if more space is needed, please attach additional sheets of paper and indicate the problems on those sheets. Open text and open notes; no other books; use calculators if desired. Numbers in bold indicate point value of question.

1. **(7 Points)** A LAN uses Mok and Ward's version of binary countdown. At a certain instant, the 5 stations have the virtual station numbers 3, 4, 1, 2, and 0. The next two stations to send are 3 and 1 in that order. What are the new virtual station numbers after both have finished their transmissions? Assume that decreasing virtual station numbers have higher precedence, i.e. 0 is the highest precedence and 4 is the lowest precedence.

2. Two neighboring nodes (A and B) use a sliding window protocol with a 3-bit sequence number. The selective repeat approach is used with a window size of 4. Assume that A is transmitting and B is receiving. Show the window positions for each of the following sequence of events:

   (a) **(5 Points)** Before A sends frame 0.

   A: 0 1 2 3 4 5 6 7 0 1 2 3 4

   B: 0 1 2 3 4 5 6 7 0 1 2 3 4

   (b) **(5 Points)** After A sends frames 0, 1, 2, 3 and B acknowledges 0, 1 and the ACKs are received by A. Frames 2 and 3 are lost.

   A: 0 1 2 3 4 5 6 7 0 1 2 3 4

   B: 0 1 2 3 4 5 6 7 0 1 2 3 4

3. **(10 Points @ 2 Points Each)** For each routing algorithm, designate whether it is an adaptive algorithm (A) or a nonadaptive algorithm (N). Circle A for an adaptive algorithm or N for nonadaptive algorithm.

   (a) Bellman-Ford A N

   (b) Link State Routing A N

   (c) Shortest Path Routing A N

   (d) Flooding A N

   (e) Multidestination Routing A N

4. For the medium access control techniques given in parts **a** and **b** below, list the steps of operation. For example, the steps of operation for 1-persistent CSMA are given below.

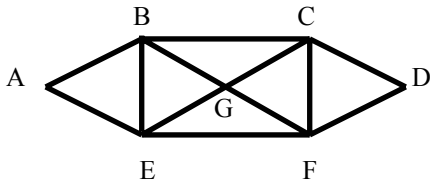
Steps of operation for 1-persistent CSMA:
Step 1. If the medium is idle, transmit; otherwise, go to step 2
Step 2. If the medium is busy, continue to listen until the channel is sensed idle; then transmit immediately.

(a) **(7 Points)** List the steps of operation for slotted ALOHA.

(b) **(7 Points)** List the steps of operation for slotted nonpersistent CSMA.

5. **(8 Points)** Eight stations, numbered 1 through 8, are contending for the use of a shared channel by using the adaptive tree walk protocol. If stations 2, 3, 5, 8 suddenly become ready at once, how many bit slots are needed to resolve the contention? *List the contents of each time slot for full credit.*

6. Use the subnet with routers A, B, C, D, E, F, and G to answers parts a, b, and c below.

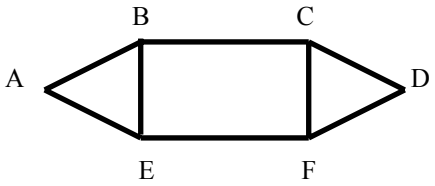


(a) **(7 Points)** Determine the sink tree for router A using the number of hops as the distance metric. *Draw the sink tree.*

(b) **(4 Points)** Determine the total number of packets generated from a broadcast network from A using the sink tree.

(c) **(7 Points)** Determine the total number of packets generated from a broadcast network from A using reverse path forwarding. *Draw the diagram used to determine the number of packets generated for full credit.*

7. **(12 Points)** Consider the subnet below. Distance vector routing is used, and the following vectors have just come in to router E: from B: (3,0,7,11,6,16); from A: (0,5,8,13,4,8); and from F: (9,8,3,4,5,0). The measured delays to B, A, and F, are 4, 6, and 5, respectively. What is E's new routing table? Give both the outgoing line to use and the expected delay.



8. **(8 Points)** Suppose a 2-Mbps 802.11b LAN is transmitting 64-byte frames back-to-back over a radio channel with a bit error rate of 10^{-6}. How many frames per second will be damaged on average?

9. **(5 Points)** Briefly describe the hidden station problem for stations in a wireless LAN. Draw a schematic to illustrate the problem.

10. **(7 Points)** List two similarities and differences between 10 Mbps Ethernet (Classic Ethernet) and Gigabit Ethernet, excluding speed as a difference.

For each of the following multiple choice questions (11-13), circle the best answer.

11. **(4 Points)** IEEE 802.16 supports four service classes. Which service class is the best choice for sending heavy transmissions such as large file transfers?

    (a) constant bit rate service (b) real-time bit rate service

    (c) non-real-time variable bit rate service (d) best-efforts service

12. **(4 Points)** The medium access control sublayer of the data link layer is primarily responsible for:

    (a) detecting and correcting errors in frames received

    (b) determining which station in a competing group of stations gets access to the shared communication channel

    (c) hiding differences between various kinds of 802 networks by providing a single format and interface to the network layer

    (d) none of the above

13. **(4 Points)** Which of the following does **NOT** characterize the operation of a bridge?

    (a) located in the data link layer

    (b) extracts the destination address from the frame header and looks up in a table to determine where to send the frame

    (c) contains line cards for networks that are the same type

    (d) used to connect 2 or more LANs

    (e) a and c

    (f) b and c

(2 Points Each) Match the IEEE standard with the network type.

14. _____ 802.11	(a) Wireless	(b) 10-Gigabit Ethernet
15. _____ 802.16	(c) Token Ring	(d) Classic Ethernet
16. _____ 802.3u	(e) Broadband	(f) Fast Ethernet
17. _____ 802.3z	(g) Resilient Packet Ring	
18. _____ 802.3ae	(i) 100-Gigabit Ethernet	
19. _____ 802.2	(j) Bluetooth	(k) Logic Link Control
20. _____ 802.17	(l) Gigabit Wireless	(m) Gigabit Ethernet