Instruction

Homework 2 covers Chapter 4 to Chapter 5. Total 100 points.
Due by 23:59 Nov, 29th, 2023.
Submit your homework (**in a single PDF file**) to the following link:
`https://send2me.cn/W0FH3_Gc/Rx6GMRqB0YhkMw`.
Grading. Please briefly explain your answer. Answer without explanation will only receive half credit. **Plagiarism is strictly forbidden, and will receive zero credit for the entire homework (20% of this course) section.**

Questions

1. ARQ (20 points)

Consider the data transmission from sender A to receiver B via the Go-Back-N (with NAK) protocol with a large window size N (so that packet transmissions will not be limited by the window size).

a) Fill in the boxes of the figure below. Write the packet number in the form of `Px`, and the response in the form of `ACKx` or `NAKx`. (14 points)

b) Write the corresponding actions (**A** for Accept, **DD** for discard as duplicates, **DE** for discard as error) for each packet at the receiver end. (6 points)

2. Medium Access Control (25 points, 5 points each)

Briefly answer the following questions **in your own words**.

a) Describe the CSMA/CA mechanism used in IEEE 802.11 (WiFi). You may draw a diagram, describe in words, or write pseudo code for this.

b) Why can't we use CSMA/CD in wireless LAN?

c) Why do we need the RTS-CTS mechanism?

d) How does a bridge learn the hosts in a LAN? (Hint: Read Chapter 4.8.2 and 4.8.3 in the textbook)

e) What are the differences between a bridge/switch and a hub? (Hint: Read Chapter 4.8.4 in the textbook)

3. IP Addressing (10 points)

Briefly answer the following questions.

a) For a network with IP address 192.168.8.0/26, how many host IP addresses can be assigned in this network? (3 points)

b) With respect to the number of destinations, IP addresses can be categorized into three types. What are they? Give an example for each type of addresses. (4 points)

c) ARP is an aiding protocol for IP. Describe in your own words how ARP request and ARP reply works. (3 points)

4. Routing: Dijkstra (20 points)

Consider the network topology as follow.
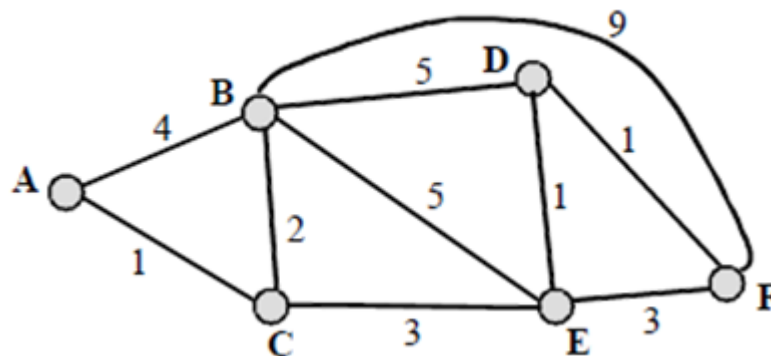
a) Describe the Dijkstra algorithm with pseudo code. (5 points)

b) Find the shortest path from node A to all the other nodes in the network with the Dijkstra algorithm. Make sure you show all your steps (with the table!). (10 points)

c) Consider a networking condition in which you are asked to write an algorithm to find the most reliable path, i.e., the path with the least Bit Error Rate (BER). Assume each link in the network has a BER (in the range of 0 and 1) that is independent of other links. Can we directly use Dijkstra algorithm? If not, how to change it to solve this problem? (5 points)

5. Routing: Bellman-Ford (10 points)

Consider the same network topology as in Question 4, and find the shortest path to node A with the Bellman-Ford algorithm. Update Order B → C → D → E → F. Make sure you show all your steps (with the table!).

6. QoS (15 points)

Give real-world examples for the following scheduling schemes.

a) FIFO Queue (4 points)

b) Priority Queue (4 points)

c) Round Robin (4 points)

d) Weighted Fair Queue (WFQ) (3 points)