Homework 4 assignment for ECE671 Posted: 03/25/2021 Due: 04/08/2021

Note: In all written assignments, please show as much of your work as you can. Even if you get a wrong answer, you can get partial credit if you show your work. If you make a mistake, it will also help the grader show you where you made a mistake.

Problem 1 (25 Points): Prefix Matching

a. Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
0	0
01	1
000	2
otherwise	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

b. Given the following forwarding table, create a binary tree that allows longest prefix match lookup.

Interface	Prefix
А	11/2
В	0101/4
С	011/3
D	01/2
E	0/1
F	0000/4

- c. In that binary graph you created, show how a search for the appropriate interface for address 01001100 would be performed. Please indicate the individual steps in the correct order.
- d. Create a tree in which always two bits per step are looked up (Trie).
- e. Show how a TCAM realization for the following forwarding table would look like.

Interface	Prefix			
А	010**			
В	0110*			
С	011**			
D	10011			

Problem 2 (25 Points): QUIC

- a. What is QUIC's underlying transport layer protocol? Why did Google decide to make use of this transport protocol?
- b. How many RTTs does it take in the case of HTTP over TCP until the first bit of a get request reaches the server? How many does it take in the case of HTTP over QUIC?
- c. Which protocols does QUIC replace?
- d. Both SPDY and QUIC support multiplexing of multiple flows into one TCP session. Why is there still head of line blocking in the case of SDY?
- e. Describe in detail how QUIC achieves reliable transmission.
- f. QUIC makes use of an UUID. What's the benefit of employing this UUID

Problem 3 (30 Points): Routing

Consider the following network. With the indicated link costs, use Djikstra's shortest-path algorithm to compute the shortest path from *A* to all network nodes. Show how the algorithm works by computing a table below.



F i	σ		r	0	1
	Б	u	I.	С	1

St	N'	D(A),p(A)	D(B),p(B)	D(C),p(C)	D(D),p(D)	D(E),p(E)	D(F),p(F)	D(G),p(G)	D(H),p(H)
ер									
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									

Problem 4 (20 Points): Firewall

Provide a filter table and connection table for a stateful firewall that is as restrictive as possible but accomplishes the following:

- a. Allow all internal users to establish File Transfer Protocol sessions with external hosts.
- b. Allow external users to surf the company's website at 128.112.32.23 and access the company's mail server at 128.112.32.24.
- c. Otherwise all inbound and outbound traffic should be blocked.

Action	Source Address	Dest address	Protocol	Source port	Dest port	Flag bit