TELCOM 2310: Applications of Networks
Fall 2022

Final Exam: December 14th, 2022

This test is to be taken individually. You are free to consult class notes and the textbook, the TA and the instructor - **absolutely no one and nothing else**! In particular, you CANNOT use anything except a scientific calculator for calculations and you CANNOT access the Internet.

The exam is due within 24 hours from the time it is picked up or December 15th, Thursday, by 10.00 a.m. whichever is earlier. The exam question sheet is to be returned along with all material you wish graded. Sign the honor pledge below after completing the exam.

Pledge:
On my honor I pledge that I have not given or received aid on this exam. I have not violated the policies stated above. I have also not spent more than 24 hours on the exam after picking it up.

Signature: _____ *Xiaoyu Xia* _____

Name: _____Xiaoyu xia_____

General Instructions:
Answer all questions. Read the questions carefully to understand what is being asked. Avoid writing unnecessary things in the answers but write all the essential steps in solving any problem. Explain the steps. If you are not able to do any numerical calculation explain clearly what you would do to solve the problem. **THERE WILL BE NO PARTIAL CREDIT FOR VAGUE ANSWERS OR UNCLEAR STEPS. I SHOULD BE ABLE TO UNDERSTAND WHAT YOU WERE TRYING TO DO WITHOUT YOUR VERBAL EXPLANATION LATER.**

1. Consider an address block 192.168.4.64/27.
   a. Suppose you want to break this address block into 2 equal-sized subnets. Give the prefix for each (in CIDR notation, i.e. a.b.c.d/x). (5)

A:
1. *we want to break this address block into 2 equal-sized subnets, so we need 2 bits for that. So the prefix should be a.b.c.d/28(because 26+2=28).*
   First subnet: 192.168.4.64/28
   Second subnet: 192.168.4.80/28

   b. Suppose you want to create as many equal-sized subnets as possible from this address block, with the requirement that each subnet must include at least 6 total addresses (4 addresses that can be assigned to devices, plus the network and broadcast addresses). What is the maximum number of subnets you can create? Clearly explain your reasoning. *Hint:*

remember that subnet sizes are NOT completely arbitrary (depends on number of bits available for host part of address). What is the smallest subnet you can make that includes at least 6 addresses? (15)

A:
The number of host bits required for 6 address per subnet = ceil(log 6) = 3 bits
Therefore, number of subnet bits left = 5 - 3 = 2
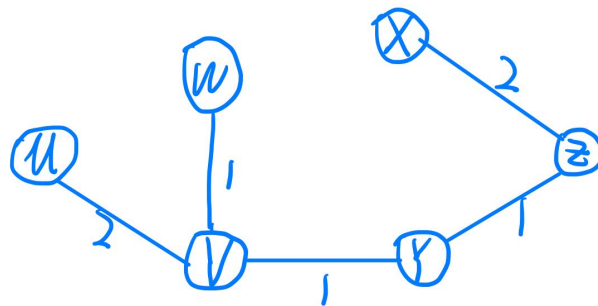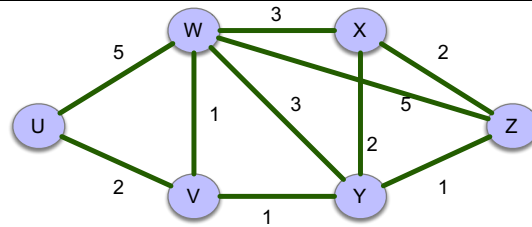**Total number of subnets that can be created = 2^2 = 4**
Each subnet is 192.168.4.64/29,   192.168.4.72/29,   192.168.4.80/29, 192.168.4.88/29.

2. Consider the network shown below. Use Dijkstra's algorithm to find the forwarding table in Node Z. Show all steps (table etc.). (20)

A:

step	N'	D(v),p(v)	D(w), p(w)	D(x),p(x)	D(y),p(y)	D(u),p(u)
0	z	∞	∞	2,z	**1, z**	∞
1	zy	**2,y**	4,y	**2,z**		∞
2	zyx	**2,y**	4,y			∞
3	zyxv		**3,v**			4,v
4	zyxvw					**4,v**
5	zyxvwu					

Forwarding table :

Destination	Outgoing link
X	(Z,X)
Y	(Z,Y)
V	(Z,Y)
W	(Z,Y)
U	(Z,Y)