CSCI 4311/5311 Final
Spring-2023

Instructions:
Submit your answer as PDF file on Moodle.
Submissions other than PDF file will not be graded.
You need to sign this form. Without signature, your exam will not be graded.
The test starts at 3 pm. The submission closes at 5 pm.
After 5 pm, I will not accept any submissions.
Make sure your handwriting is readable.
Use your own words, do not copy paste from slides, book, or internet
Total Marks = 110 **Time: 120 minutes**

If I see any sign of cheating, I will give 0 for all sides who involved the cheating activity. If you get 0 from the final, you will directly get "F".

You are to abide by the University of New Orleans honor code.
Please sign below to signify that you have kept the honor code pledge.

Honor code pledge:
I pledge that I have completed the work I am submitting according to the principles of academic integrity as defined in the statement on Academic Dishonesty in the UNO Student Code of Conduct.
For more details: https://www.uno.edu/media/15321

Academic dishonesty includes, but is not limited to, the following:
Cheating, Plagiarism, Academic Misconduct, Falsification and Fabrication

Name: Shakayla Mosely
ID: 25836089
Signature: Shakayla Mosely
Date: 5/16/23

Good Luck!

(Q1) [18 points]

a-)[5 points] What is the **maximum and minimum waiting time** for a node on a 1 Gbps ethernet network after the 4th collision?

Min = 0 wait time

$2^4 - 1 = 15 \times 512 = 7680 / 1\text{Gbps} \approx 7.68$

b-)[6 points] What is the **maximum and minimum waiting time** for a node on a 10 Gbps ethernet network after the 8th collision?

$2^8 - 1 = 255 \times 512 = 13{,}056 / 10\text{Gbps} \approx 13.056$

c-)[7 points] What is the **maximum and minimum waiting time** for a node on a 100 Mbps ethernet network after the 18th collision?

$2^{10} - 1 = 1023 \times 512 = 523\,776 / 100 \approx 5237.76$

(Q2) [16 points] Briefly explain the following questions.

a-) [8 points] Explain the difference between forwarding and routing.

[redacted] the process of moving data packets from the input interface of a network devices to the appropriate interface for delivery to it destination. Occurs within a single network devie & is preformed at nigh speed using hardware-based forwarding mechanisms. [redacted] is the process of determining the path that data packets should take across an interconnected network to reach their intended destination. It involves making intelligent decisions based on network-layer information to find the optimal route for packet delivery

b-)[8 points] Explain the difference between router and switch.

A [redacted] is a network device the operates at the data link layer of the OSI model. Its primary functions is to facilitate communication within a local area network by forwarding data packets between devices connected to it.

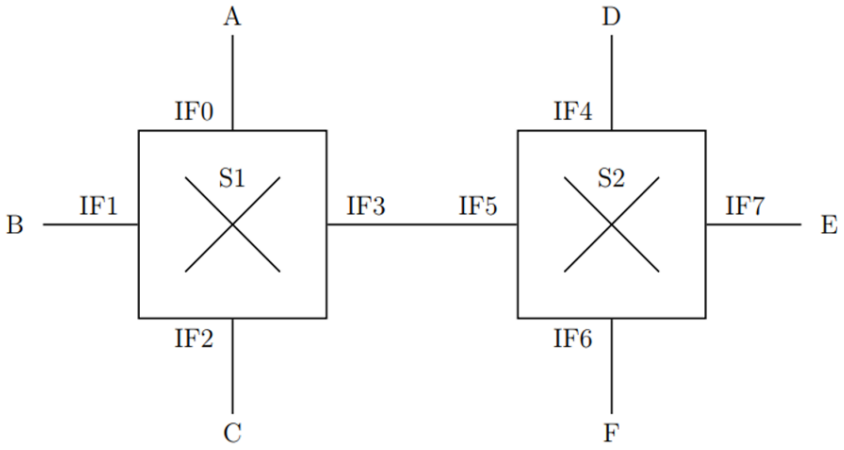
A [redacted] is a networking device that operates at the network layer of the OSI model. Its primary fuction is to connect multiple networks together and facilitate the transfer of data between them.

(Q3) [28 points]

Consider the following network topology that has two switches and 6 hosts. The host MAC addresses are A to F and the switch interface numbers run from IF0 to IF7. Initially, all of the switching tables are empty. The following packets with destination and source MAC addresses are sent in the network.

Give a step by step account of the forwarding decisions made by the switches. At each stage, show the switching tables.
Note: You can assume that TTL is 60.

	Source MAC	Destination MAC
1	B	A
2	D	C
3	C	F
4	F	E
5	E	C



	S1			S2		
	MAC	**Interface**	**TTL**	**MAC**	**Interface**	**TTL**
0 - Initial	Empty	Empty	Empty	Empty	Empty	Empty
1 = B – A	B	IF 1	60	A		60
2 = D – C	C	IF 3	60	D	IF4	60
3 = C – F	C	IF 2	60	F	IF6	60
4 = F – E	F		60	E	IF 7	60
5 = E - C	C	IF 2	60	E	IF7	60

(Q4) [20 points]

We have 6 routers labeled A-F. Suppose we have the initial link weights shown below.

A	
Destination	**Cost**
A	0
B	-
C	5
D	3
E	-
F	-

B	
Destination	**Cost**
A	-
B	0
C	7
D	-
E	4
F	6

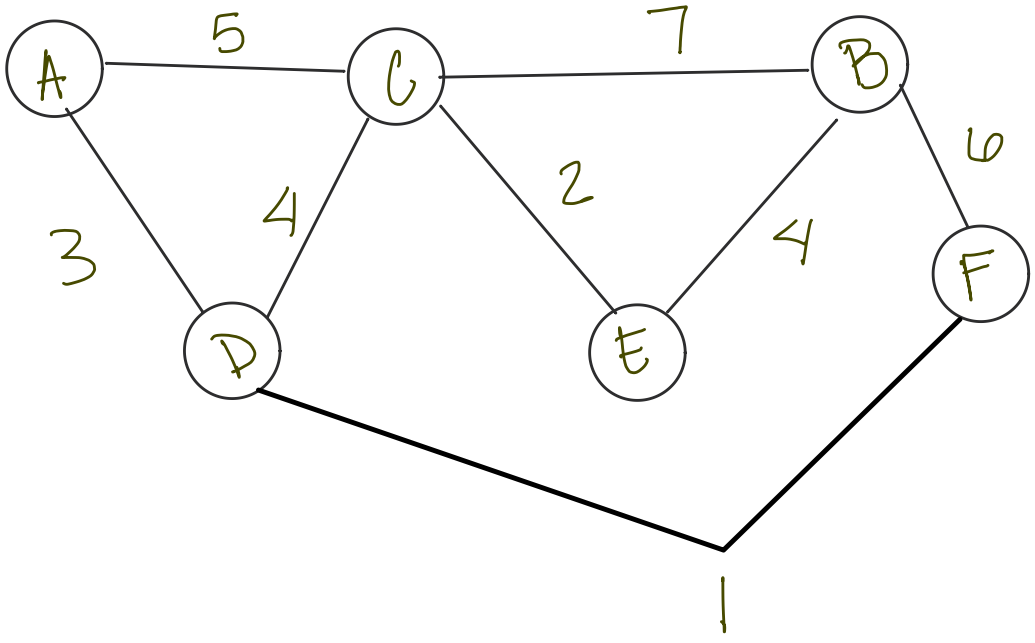
C	
Destination	**Cost**
A	5
B	7
C	0
D	4
E	-
F	-

D	
Destination	**Cost**
A	3
B	-
C	4
D	0
E	-
F	1

E	
Destination	**Cost**
A	-
B	4
C	2
D	-
E	0
F	-

F	
Destination	**Cost**
A	-
B	6
C	-
D	1
E	-
F	0

(a)[10 points] Draw the graph consistent with these tables. Make sure that you label all routers and write the link weights.
P.s. Present your graph as simple as possible. I don't want to see lots of crossing lines which makes the graph hard to see.
Hint: Yes, you can present this graph without crossing any links.



Note for b and c: You need to show all routers in the path. E.g. if the path is A-B-D-E show it like this and calculate the path cost. Also, there might be more than 1 possible paths, but you need to show the least costly path.

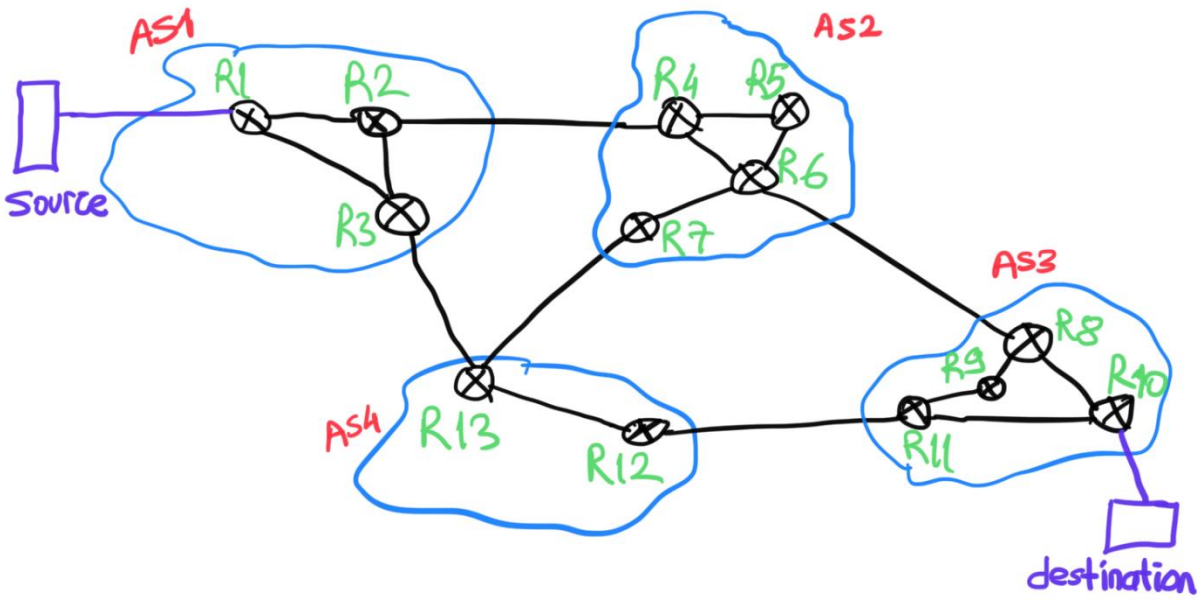
(b)[5 points] If a message is originated from A and a destination is B. Which path does it take? What is the path cost?

A → D
D → F
F → B = 10 = COST

(c)[5 points] If a message is originated from C and a destination is B. Which path does it take? What is the path cost?

C → E
E → B = 6 = COST

(Q5) [28 points]



Assume that we have a network topology which contains 4 Autonomous Systems, AS1, AS2, AS3, and AS4. Assume that all business relations between ASes are peer-to-peer.

a-) [16 points]
For given topology, show all BGP path advertisements for destination X in **each BGP speaking routers**.
Only show AS-PATH and NEXT-HOP attributes. You can use R1, R2, R3 etc. as IP address of the router.
Note: You don't need to redraw the topology. Verbal answer is fine.
E.g. From R1 – R2 => AS-PATH = {ASx, ASy, ASz} Next-hop = {Rx}
Write all BGP path advertisement like this.
HINT: BGP protocol is destination based, not source based.

R1→R2
R2→R4
R4→R5
R5→R6
R6→R8
R8→R10→Destination

R1→R3
R3→R13
R13→R12
R12→R11
R11→R10→Destination

R1→R2
R2→R4
R4→R5
R5→R6
R6→R7
R7→R13
R13→R12
R12→R11
R11→R10→Destination

R1→R2
R2→R4
R4→R6
R6→R8
R8→R10→Destination

b-) [6 points] Explain what the reason for can be choosing the “AS1-AS2-AS3” path instead of the “AS1-AS4-AS3” path. Note that, all ASes have peer to peer business relationships. Therefore, money is not the reason here.

taking the AS1-AS2-AS3 path versus AS1-AS4-AS3 can be more of a cost depending on how it looks Assuming all of them have a physical link to each other, it could lead to a cost reason

c-) [6 points] Show which links use eBGP and which links use iBGP.
Note 1: You can assign labels to each links and show your results.
E.g. R1 – R2 => label1, uses iBGP or eBGP.
Note: You can redraw the topology figure here.
Note 2: If you prefer, you can use - - - for iBGP and --- for eBGP. Choose the one which is easier for you (Note 1 or Note 2)

R1-R2 iBGP
R1-R3 iBGP
R2-R3 iBGP
R3-R13 eBGP
R2-R4 eBGP
R4-R5 iBGP
R4-R6 iBGP
R5-R6 iBGP
R6-R7 iBGP
R7-R13 eBGP
R13-R12 iBGP
R6-R8 eBGP
R12-R11 eBGP
R8-R9 iBGP
R8-R10 iBGP
R9-R11 iBGP
R11-R10 iBGP