CSC 458/2209: Computer Networking Systems, Winter 2025

Μ	idterm Solutions	Date: Monday March 3, 2025					
Se	ction L0101						
1)	b						
2)	c						
3)	b						
4)	a						
5)	a						

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6-9) Please check the lectures slides for these.

10a) and 10b) There are 5980 bytes of data in the original packet. With MTU of 1200 bytes, we can have 1180 bytes of data per fragment which will lead to 5 full packets (1180 bytes of data + 20 bytes of header) + one packet with 80 bytes of data (and 20 bytes of header) for a total of 6 packets.

Since we do not need to consider the fragmentation offset being a multiple of 8, the packet offsets are going to be 0, 1180, 2360, 3450, 4720, and 5900.

10c) The total size of packets after fragmentation is $5 \times 1200 + 100 = 6,100$, whereas the original packet is 6000 bytes. The ratio would be 6100/6000.

11) For breaking ties, we will update only if the new path is shorter (not equal). You can have a different method for breaking ties and as longs as you explicitly express it, you will get the mark.

As you can see, the algorithm converges in 2 steps in this case (step 3 and 2 are the same).

Table for A		Т	able for	В	Table for C			Table for D		Та	ble for	E		
Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop
Α	0	А	Α	3	А	Α	-	-	Α	1	А	Α	-	-
В	3	В	В	0	В	В	1	В	В	2	В	В	4	В
С	-	-	С	1	С	С	0	С	С	-	-	С	1	С
D	1	D	D	2	D	D	-	-	D	0	D	D	4	D
E	-	-	Е	4	E	Е	1	E	Е	4	E	Е	0	E

Step 1:

Step 2:

Table for A		Table for B			Table for C			Table for D		Та	ble for	E		
Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop
Α	0	А	Α	3	А	Α	4	В	Α	1	А	Α	5	D
В	3	В	В	0	В	В	1	В	В	2	В	В	2	С
С	4	В	С	1	С	С	0	С	С	3	В	С	1	С
D	1	D	D	2	D	D	3	В	D	0	D	D	4	D
Е	5	D	Е	2	С	Е	1	E	Е	4	Е	Ε	0	E
Step 3 Table f	: or A	Та	able for	В	Table for C			Table f	or D	Table for E				
Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop	Dest	Cost	Next Hop
Α	0	А	Α	3	А	Α	4	В	Α	1	А	Α	5	D
В	3	В	В	0	В	В	1	В	В	2	В	В	2	С
С	4	В	С	1	С	С	0	С	С	3	В	С	1	С
D	1	D	D	2	D	D	3	В	D	0	D	D	4	D

12a) AS6 \rightarrow AS2 \rightarrow AS3 \rightarrow AS7

AS2 and AS3 have a peer-peer relationship, therefore they have agreed to serve each others customers.

12b) Yes. Since there is a peer-peer relationship between AS2 and AS3 they will carry the traffic from H6 to H8.

12c) No. Even though there is a path from AS3 to AS5, the traffic has to go through AS4. AS4 is not a provider to AS3 or AS5. It has peer-peer relationship with both. Therefore, it is not expected to act as a transit node for their traffic.

12d) No. AS1 is not connected to AS3 the traffic has to go through either AS4 or AS2 and then through a peer-peer link. AS4 and AS2 will not act as a transit for their peers. They are supposed to carry traffic from/to customers of the peer not anything that goes through the provider (or other peers).

13a) S1 is the root. Every node from S2 to S9 will be directly connected to root with a cost of one therefore all links connecting S2 to S3, S3 to S4, S8 to S9 and S9 to S2 will be discarded.

13b) The length of path from A to B is 4 (A \rightarrow S2 \rightarrow S1 \rightarrow S3 \rightarrow B). The length of path from C to D is also 4 (C \rightarrow S6 \rightarrow S1 \rightarrow S7 \rightarrow D).

13c) S2 will be the new root. In addition to all links connected to S1, the link between S6 and S7 will be discarded (here S6 has a path of length 4 to S2 through both S5 and S7, and it will choose S5 as it has a smaller ID).

13d) Path between A and B is of length 3: A \rightarrow S2 \rightarrow S3 \rightarrow B

Path between C and D is of length 9: $C \rightarrow S6 \rightarrow S5 \rightarrow S4 \rightarrow S3 \rightarrow S2 \rightarrow S9 \rightarrow S8 \rightarrow S7 \rightarrow D$.

14a) 10.0.1.70 matches the first rule, the second one, the third one, and the fourth one. Among those the 4th one has the longest prefix so Router D will be selected as the next hop.

14b) 10.0.1.100 matches the first, the second and the third rules. Since the third rule has the longest prefix, Router C will be selected as the next hop.