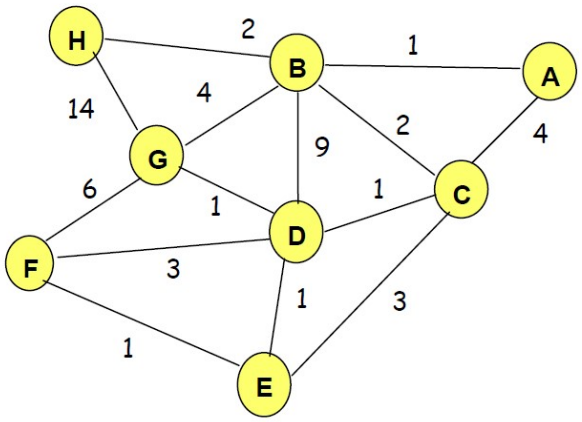
Answer for EE3315 Test 1 2013-2014

Question 1. **(16 marks)**

Consider the following network:



If **the cost between Node C and Node E becomes one**, using Dijkstra's algorithm, compute the shortest path from **Node E** to all network nodes. Use the table form below but work out the results in your answer sheet. If there is a tie, ***break it in favor of leftmost column***. List out all the shortest paths from Node E to all the other nodes.

N	A	B	C	D	F	G	H
E	∞	∞	1, E	1, E	1, E	∞	∞
E,C	5, C	3, C		1,E	1, E	∞	∞
E,C,D	5, C	3, C			1,E	2, D	∞
E,C,D,F	5, C	3, C				2, D	∞
E,C,D,F,G	5, C	3, C					16, G
E,C,D,F,G,B	4, B						5, B
E,C,D,F,G,B,A							5, B
E,C,D,F,G,B,A,H							

The shortest path from Node E to
A; ECBA
B: ECB
C: EC
D: ED
F: EF
G: EDG
H: ECBH

Question 2. **(8 marks)**

Consider the Vector-Distance update shown in the Fig. Q2 below. It shows an existing table (i) in a gateway K, and update message (ii) from another gateway J. Write down the changes in the table and give the reasons for those changes. Assume that the distance between gateway K and J is 3.

Destination	Distance	Route
Net 1	0	Direct
Net 2	0	Direct
Net 4	8	Gate L
Net 17	8	Gate M
Net 24	2	Gate J
Net 30	5	Gate J
Net 42	4	Gate Q

(i) An existing routing table for a gateway K

Destination	Distance
Net 1	2
Net 4	2
Net 5	4
Net 17	1
Net 24	3
Net 30	1
Net 42	2

(ii) An incoming routing update message from gateway J.

Figure Q2

Destination	Distance	Route
Net 4	5	Gate J
Net 5	7	Gate J
Net 17	4	Gate J
Net 24	6	Gate J
Net 30	4	Gate J

Figure Q2-1

For destination Net 4, it updates that a shorter distance resulting from routing via gateway J.

For destination Net 5, it updates that a new route is setup via gateway J.

For destination Net 17, it updates that a shorter distance resulting from routing via gateway J.

For destination Net 24, it updates that if passing via gateway J, it will take longer route.

For destination Net 30, it updates that a shorter distance resulting from routing via gateway J.

Question 3. **(26 marks)**

In Figure Q3, assume that link AD has gone down for a long time. Assume B, C and D use split horizon with Poisoned Reverse.

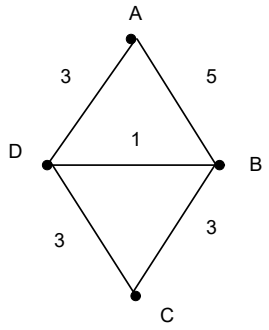


Figure Q3

i. What distance to A will D report to B? ∞
ii. What distance to A will B report to D? 5
iii. What distance to A will D report to C? 6
iv. What distance to A will C report to D? 8

Now, suppose link AB goes down.
v. What distance to A will B report to C? ∞
vi. At the same time, what distance to A will C report to B? ∞
vii. At the same time, what is the distance to A that D reports to B? ∞
viii. At the same time, what is the distance to A that D reports to C? 6
ix. What does C then think the shortest path to A is? C-D-B-A
x. What does C then tell B about its distance to A? 9
xi. What does C then tell D about its distance to A? ∞
xii. What is B's route to A now? B-C-D-B-A
xiii. What does B then tell D the distance to A? 12

Question 4. **(10 marks)**

Figure Q4 shows a network using Hierarchical Routing. Draw down the topology of the network from Node 3B's point of view under the use of Hierarchical Routing. Write down the routing table for node 3B. Note that for each destination, "next hop" and "number of hops" (to that destination) should be included.

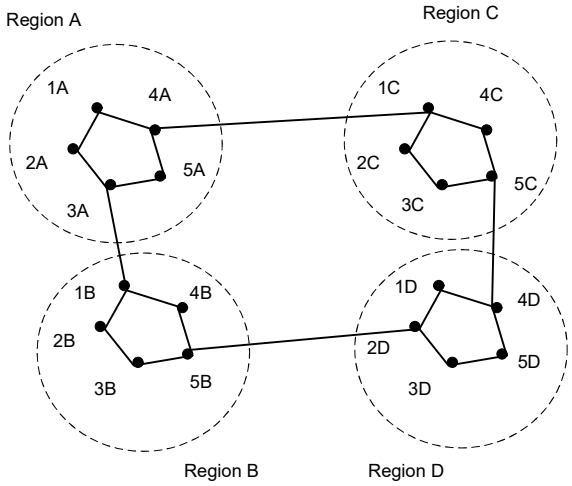
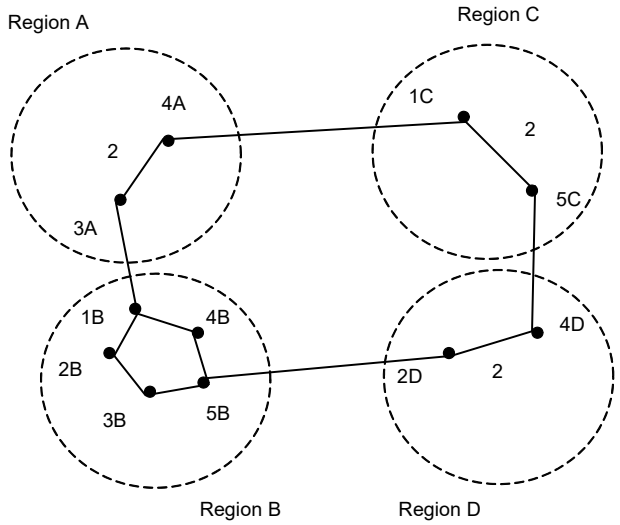


Figure Q4

Routing table for 1C



Destination	Next Hop	No. of Hops
3B	-	-
1B	2B	2
2B	2B	1
4B	5B	2
5B	5B	1
A	2B	3
C	5B	5
D	5B	2

Question 5. **(16 marks)**

Using TCP EA-RTT estimator (Exponential Average Round-Trip Time estimator), we have the following equation:

$$\text{EA-RTT}(K + 1) = (1 - \alpha) \times \text{EA-RTT}(K) + \alpha \times \text{RTT}(K).$$

(i) Assume that all the RTT(K) are the same and equal to RTT. Write down the

expression for EA-RTT(n) in terms of EA-RTT(2) and RTT. *Hint:* The equation for calculating EA-RTT can be rewritten to simplify the calculation, using the equation $(1 + \ldots + \beta^{n-2} + \beta^{n-1}) = (1 - \beta^{n})/(1- \beta)$. [10 marks]

(ii) Choose $\alpha = 0.2$ and EA-RTT(2) = 2 seconds, and assume all measured RTT values = 5 second and no packet loss. What is EA-RTT(30) using the expression written in (i)? [6 marks]

(i) $$\text{EA-RTT}(n) = (1 - \alpha)^{n-2}\,\text{EA-RTT}(2) + \alpha \times \text{RTT}\,((1 - \alpha)^{n-3} + (1 - \alpha)^{n-4} + \ldots + 1)$$
$$= (1 - \alpha)^{n-2}\,\text{EA-RTT}(2) + \text{RTT}\,[1 - (1 - \alpha)^{n-2}]$$

(ii) $$\text{EA-RTT}(30) = (1-0.2)^{28} \times 2 + 5\,[1 - (1-0.2)^{28}] = 4.994 \text{ sec}$$

Question 6. **(12 marks)**

Imagine that a white army is encamped in a valley. On both of the surrounding hillsides are blue armies. The white army is larger than either of the blue armies alone, but together the blue armies are larger than the white army. If either blue army attacks by itself, it will be defeated, but if the two blue armies attack simultaneously, they will be victories. The blue armies want to synchronize their attacks. However, their only communication medium is to send messengers on foot down into the valley, where they might be captured and the message lost.

a) Does a protocol exist that allows the blue armies to win? [4 marks]

b) What is the concern of the side of blues armies who sends the last message for attacking the white army? [4 marks]

c) What conclusion we can draw from this "two-army problem" for the connection termination problem? [4 marks]

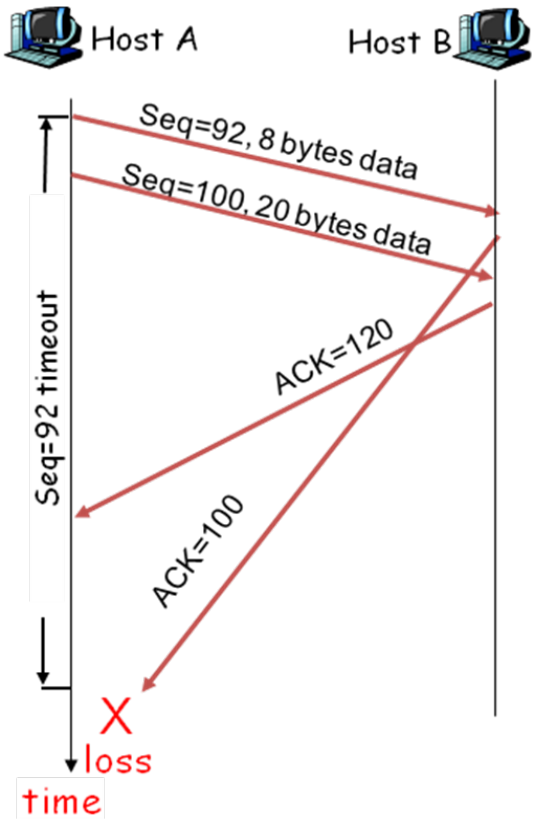
a) No, it does not exist.

b) They are not sure that their message can get through so they may not take the risk to attack.

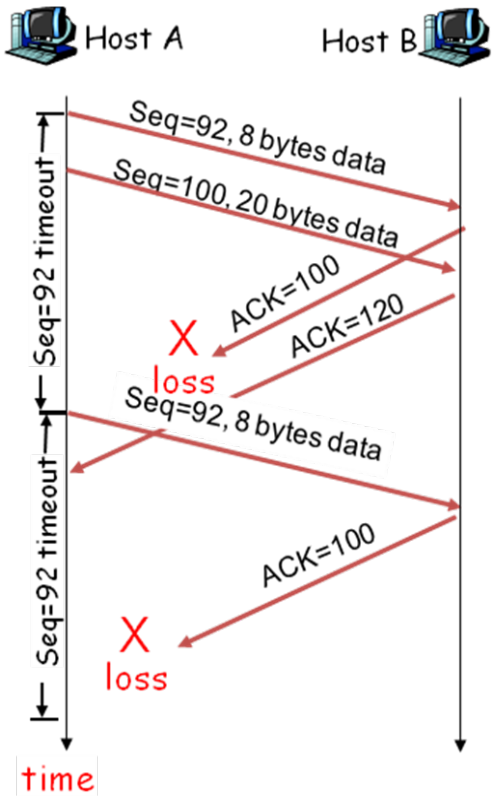
c) No protocol exits that allows two users to synchronize their connection termination through an unreliable channel/network where disconnection messages could be lost.

Question 7. **(12 marks)**

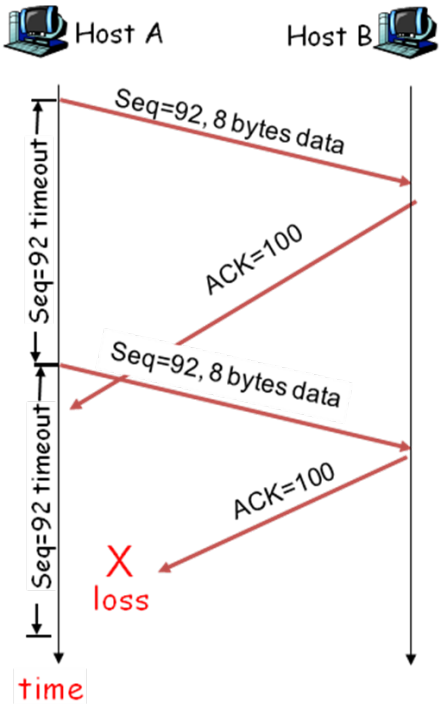
After Host A reaches the expected timeout limit in the following four situations, describe whether Host A will retransmit any segment(s) or not and the reason behind.


Host A
Host B
Seq=92, 8 bytes data
Seq=100, 20 bytes data
ACK=120
ACK=100
Seq=92 timeout
X
loss
time

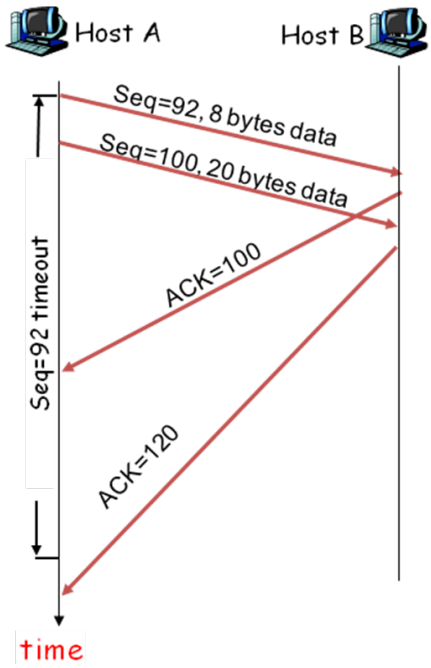
(a)


Host A
Host B
Seq=92, 8 bytes data
Seq=100, 20 bytes data
ACK=100
ACK=120
Seq=92 timeout
X
loss
Seq=92, 8 bytes data
ACK=100
Seq=92 timeout
X
loss
time

(b)


Host A
Host B
Seq=92, 8 bytes data
ACK=100
Seq=92 timeout
Seq=92, 8 bytes data
ACK=100
Seq=92 timeout
X
loss
time

(c)


Host A
Host B
Seq=92, 8 bytes data
Seq=100, 20 bytes data
ACK=100
Seq=92 timeout
ACK=120
time

(d)

(a) Host A will not retransmit segment after the timeout since the acknowledgment (ACK=120) was received before the timeout meaning the segments with sequence number 92 has been successfully received.
(b) Host A will not retransmit segment after the timeout since the acknowledgment (ACK=120) was received before the timeout meaning the segments with sequence number 92 has been successfully received.
(c) Host A will not retransmit segment after the timeout since the corresponding acknowledgment (i.e. ACK=100) was received before the timeout meaning the segments with sequence number 92 has been successfully received.
(d) Host A will not retransmit segment after the timeout since the corresponding acknowledgment (i.e. ACK=100) was received before the timeout meaning the segments with sequence number 92 has been successfully received.

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