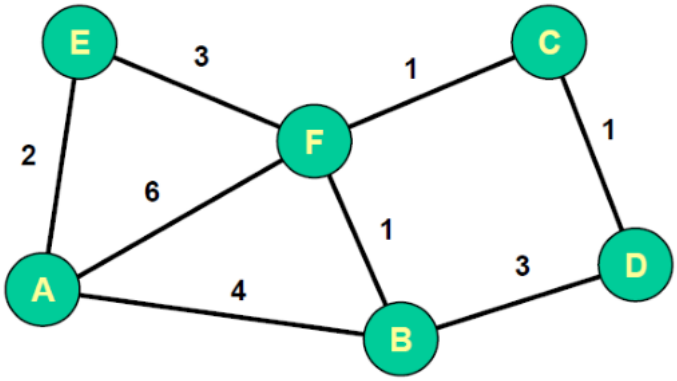
Computer Networks (14033103-4)

Homework #3



Q1: The routers in the network depicted by the figure above agree to use **distance-vector protocol** to build their routing tables. If **router A** just join the network with routing table only showing the cost to reach its immediate neighbors, how would the table of **router A** looks like after receiving the following tables in sequence: table of router B then table of router F then table of router E? (the received tables are shown bellow.)

Table of A		
Dest	Cost	Next Hop
A	0	A
B	4	B
C	6	E
D	7	B
E	2	E
F	5	B

Q2: If routers B, C, and D in the figure above Q1 had the routing tables bellow (after router F failed). Assume both the 1st and the 2nd improvements (stop circular path & Force update) are employed. Show the new routing table of **router D** after receiving the following tables in sequence: table of router C then table of router B.

New Table of D		
Dest	Cost	Next Hop
A	7	B
B	3	B
C	1	C
D	0	D
F	4	B

Q3: In the figure above Q3, if the routers agree to use the OSPF protocol (a link state method) to build their routing tables. Routers start flooding LSAs which to help each other in building a complete graph structure for the network. At one time during the flooding, router E has the following information in its LSDB:

LSDB of router E

Origin: router A Sequence Number: 00000000 Age: 85 seconds	
Neighbors	Cost to reach
F	6
B	4
E	2
Origin: router F Sequence Number: 00000000 Age: 103 seconds	
Neighbors	Cost to reach
A	6
B	1
C	1
E	3

If router E got the following LSA from router F, answer the following:

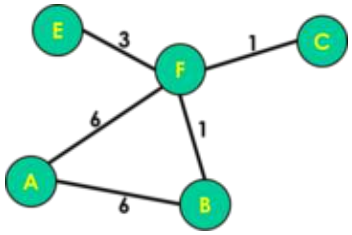
Origin: router A Sequence Number: 00001011 Age: 537 seconds	
Neighbors	Cost to reach
F	6
B	6
E	∞

a) How would the LSDB of **router E** looks like after completing the OSPF process?

LSDB of router E

Origin: router A Sequence Number: 00001011 Age: 537 seconds	
Neighbors	Cost to reach
F	6
B	6
E	∞
Origin: router F Sequence Number: 00000000 Age: 103 seconds	
Neighbors	Cost to reach
A	6
B	1
C	1
E	3

b) Draw the graph of the network as seen by **router E** at this stage.



Q4: In TCP, hosts need to set the retransmission timeout (RTO) dynamically to adapt for the routing performance and optimize the bandwidth utilization. Assume that one sending hosts found from previous packet/acknowledgement pairs that the RTT between it and the receiver is 45 mS. What will be the RTO of that sending host after receiving a new packet/Ack pair with a new RTT sample = 100 mS. (assume that α=0.875)

$$Estimated\ RTT\ =\ \alpha\ (old\ RTT)\ +\ (1\ -\ \alpha)\ (new\ RTT\ sample)$$

$$Estimated\ RTT\ =\ 0.875\ (45)\ +\ 0.125\ (100)$$

$$Estimated\ RTT\ =\ 51.875\ mS$$

➔ RTO = 2 * Estimated RTT

RTO = 103.75 mS

Q5: If two hosts start communicating using TCP Reno (with fast retransmit and fast recovery). Answer the following:

a) What would be the size of the congestion window and the congestion threshold after the 9th RTT if the congestion threshold was initially = 4 MSS and no duplicate Acknowledgement or timeout have been observed during the first 9 RTT.

congestion window = 11 MSS
congestion threshold = 4 MSS

b) If at the 10th RTT, the sender observed duplicate Acknowledgment, what would be the size of the congestion window and the congestion threshold in the next RTT? (the 11th RTT). What congestion control phase would the sender enter next?

congestion window = 5.5 MSS
congestion threshold = 5.5 MSS
Enter Congestion avoidance phase.

c) From the 11th RTT to the 18th all the segments that were sent had been acknowledged correctly. But at the 19th RTT, the sender observed a timeout before it received any acknowledgement. What would be the size of the congestion window and the congestion threshold in the next RTT? (the 20th RTT). What congestion control phase would the sender enter next?

congestion window = 1 MSS
congestion threshold = 6.75 MSS
Enter slow start phase.