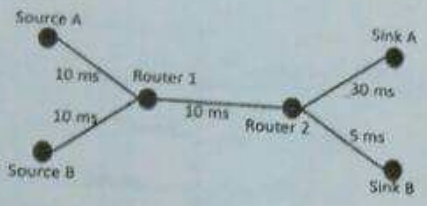
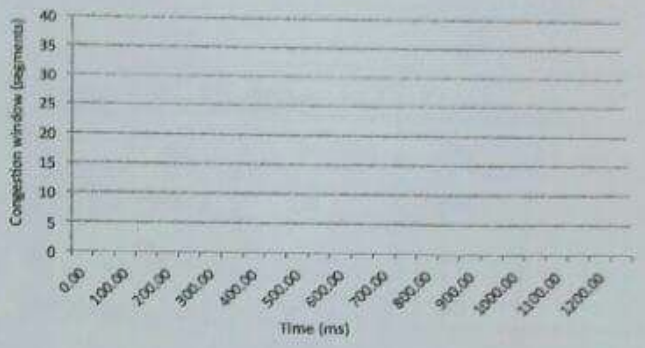
2015-2016 Computer Networks and Technologies - Final Exam
16.05.2016 – 20:20 – Duration: 75 min, Books and notes are closed. Good Luck.

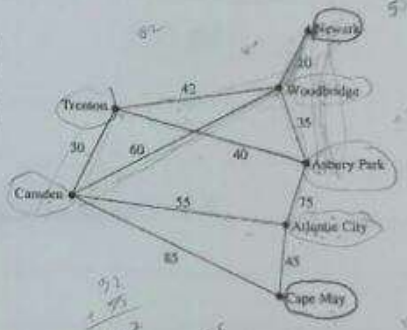
1. **TCP Congestion Control (30 p)** – Consider the following network diagram for this problem. Assume that there are two parallel TCP transmissions (*TCP1 and TCP2*) inside the network.
TCP1 is between Source A and Sink A and uses *TCP Tahoe*.
TCP2 is between Source B and Sink B and uses *TCP Reno*.
Initial *ssthresh* values is set to 32 for both transmissions. Note that there is no additional delay through forwarding, thus RTT is only two times of sum of delays indicated on each link. Use the blank graphic drawing below both of your answers.

   a. For transmission TCP1, draw the resulting congestion window, assuming that a packet loss (triple duplicate ACK) is detected at time t=900 ms
   b. For transmission TCP2, draw the resulting congestion window, assuming that a packet loss (triple duplicate ACK) is detected at time=650 ms.





2. **Shortest Path Problem (25 p)** – This graph shows the major roads in New Jersey City, and the weights represent the distances between cities. Find a shortest route in distance between Newark and Cape May, using these roads. Draw and fill in your table using Dijkstra algorithm. Write down the full path and the total distance clearly.



3. **TCP Timeout (15 p)** - Suppose that, in a TCP connection, the current values for EstimatedRTT and DevRTT values are 1.0 sec and 0.0 sec respectively, and also $\alpha = \beta = 1/8$. Then, suddenly the next measured RTT becomes 5.0 sec in this connection. Calculate the next estimated RTT, deviation RTT and Timeout values on the next interval.

4. **IP Fragmentation (15 p)** - Assume a router receives an IP datagram with the following fields: Total Length: 4020, Identification 1234, Fragmentation Offset: 0 and Flag: 0. Assume the router must now transmit this datagram across an Ethernet (MTU: 1500 bytes). Show the values of the fields above for each fragment constructed if the router attempts to send them. Assume that there are no options specified in the IP header.

5. **CIDR (15 p)** - Assume that the network in the figure uses CIDR. Five packets (A-E) arrives to this network through incoming interface L0. The destination subnets of these packets are shown on the figure. According to this information, fill in the forwarding tables of the two routers R1 and R2 seperately.

A=1001100
B=1001101
C=1001001
D=1001010
E=1000100