

***KFUPM - COMPUTER ENGINEERING DEPARTMENT*****COE-540 – Computer Networks – Assignment 4 – Due Mon Dec 26<sup>th</sup>, 2011****Student Name:****Student Number:**

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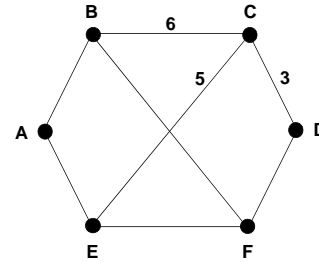
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Problem	Total Points	Points
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
Total	80	

**Problem 1 (10 points):** Consider the network of Figure 12 (a) shown below. Distance vector routing is used and the following vectors have just come in to router C:

- from B: (5, 0, 8, 12, 6, 2);
- from D (16, 12, 6, 0, 9, 10); and
- from E (7, 6, 3, 9, 0, 4)

The cost of the links from C to B, D, and E are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the cost. Show your work.

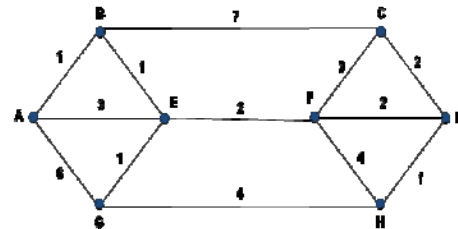


**Problem 2 (10 points):** Solve problem 7 textbook page 508 for number of routers equal to 8500. Specify the number of rows in the routing table in your design.

**Problem 3 (10 points):** Consider the network shown in Figure.

It is desired to create two optimal (i.e. shortest) *redundant* paths from router A to router F such that the second path can survive any link failure on the first path. Assume routers are reliable and do not fail.

Derive the two optimal redundant paths and show your work.



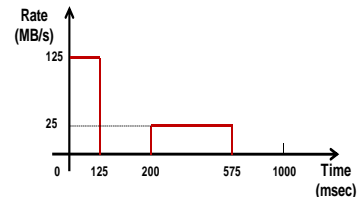
**Problem 4 (10 points):** On the topic of link state routing.

Explain the role of both the sequence number and the age fields in the distribution of link state packets.

**Problem 5 (10 points):**

Consider the token bucket mechanism for traffic shaping. The shown Figure corresponds to traffic generated by a host. If the token bucket has the parameters  $R = 25$  MB/s and  $B = 9600$  KB

- a) Specify the output of the host shaped by the token bucket. That is, provide a plot of the rate in MB/s versus time (for the first 1000 msec) while specifying the coordinates of all points on the curve.
- b) Provide a plot specifying the bucket level in KBs as a function of time (for the first 1000 seconds) while specifying the coordinates of all points on the curve.



**Problem 7 (10 points):**

Explain the following terms briefly.

- a) The sink tree.
- b) Deficit round robin
- c) QoS routing
- d) Traffic policing
- e) Traffic engineering (in the context of traffic-aware routing)

**Problem 8 (10 points):**

For a network to exercise admission control, the network should be capable of describing the traffic flows. The RFC 2210 and 2211 for Integrated Services specify 5 distinct parameters for describing a traffic flow.

- a) List these parameters and briefly explain each parameter specifying how it is needed to specify the flow and how it is distinct.
- b) When traffic flow passes through a router, the parameters used to specify the flow can be used to decide whether to admit or not admit the flow. From the perspective of throughput and delay, specify the procedure followed at the router to arrive at this decision. Will the router be able to provide hard guarantees in terms of the required throughput and delay? Explain.
- c) Now, this traffic flow will have to pass through a sequence of routers on its path from source to destination. Would the entire network be able to provide a hard guarantee on the *end-to-end* throughput and delay? Explain.