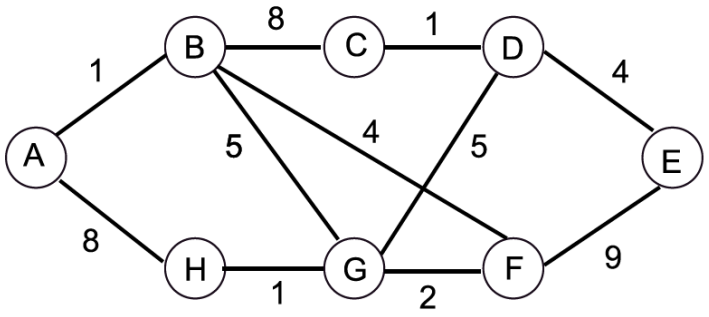
ELEN E6761: Communication Networks

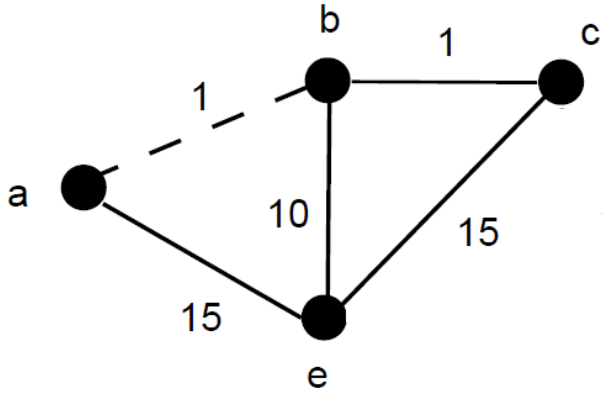
Homework 6: Routing Due: 11/21/2017

1. Consider the network shown below. Use a table to illustrate the computation process of Dijkstra's algorithm at node A.

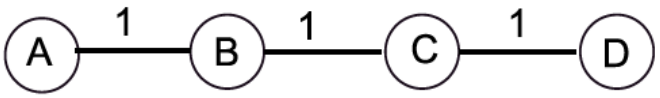


2. Consider the network above. Assume node A is the only destination in the network. Use a table to show the computation process of the Bellman-Ford algorithm. (Each row in the table corresponds to one iteration of the algorithm and each column is a pair $(D_i(A), H_i(A))$ where $D_i(A)$ is the cost from i to A and $H_i(A)$ is the next hop on the path from i to A).

3. In Dijkstra's algorithm, nodes need to have consistent knowledge of link costs. Otherwise, packets may not be correctly routed to their destinations. For example, when the cost of a link changes but the change is not known by all the nodes in the network, *transient loops* may occur. Consider the network below, where nodes a and b know the failure of link ab; but nodes c and e do not. Use Dijkstra's algorithm to construct routing tables at nodes b, c, and e, and then show that packets from e to a will loop between nodes b and e.



4. Consider the network below, where each link has a cost of 1.



Assume node A is the only destination, and nodes calculate the shortest paths using the Bellman-Ford algorithm. The initial routing tables at each node are illustrated in the table below.

$(D_A(A), H_A(A))$	$(D_B(A), H_B(A))$	$(D_C(A), H_C(A))$	$(D_D(A), H_D(A))$
(0,A)	(1,A)	(2,B)	(3,C)

(i) Assume link BA goes down and B finds out about this failure. Wire down the first few iterations by adding rows to the above table, under the synchronized Bellman-Ford algorithm. Observe that each node's cost of a path to A slowly increases and goes to infinity.

(ii) Assume link BA goes down but there is another link between node A and node D with cost 10. Starting from the initial routing tables, how many iterations does it take for all nodes to find the alternative path to node A?

(iii) We saw in the class that one way to resolve the slow convergence issue is Poisoned Reverse. Illustrate the updates of the routing tables using the Poisoned Reverse rule.