CS 440 – Fall 2005 HW 2 Nov. 11, 2005 Name: <u>Key</u>

4.17 For the network shown, show how the *link-state* algorithm builds the routing table for node D. (I said that you should show how Djikstra's shortest path algorithm would be used for the network to build all shortest paths – show how M and C(n) are updated with each iteration.) (4)



Dijkstra's Shortest Path Algorithm:

M = [s]For each *n* in *N* - { *s* } C(n) = l(s, n)While ($N \neq M$) $M = M \cup \{w\}$ s.t. C(w) is min for all *w* in (*N* - *M*) For each *n* in (*N* - *M*) $C(n) = \min(C(n), C(w) + l(w, n))$

Initially, $N = \{ A, B, C, D, E, F \}$, and l(i, j) is

	А	В	С	D	Е	F
Α	0	-	3	8	-	-
В	-	0	0	0	2	-
С	3	-	0	-	1	6
D	8	-	-	0	2	-
Е	-	2	1	2	0	-
F	-	-	6	-	-	0

So $M = \{ D \}$, and C(n) = [8, -, -, 2, -]

Choose smallest-cost entry in $C(n)$: $w = E$, $C(E) = 2$,
$M = \{ D \} U \{ E \} = \{ D, E \}, C(n) = [8, 4 (E), 3 (E), 2, -]$
Choose next smallest-cost entry in $C(n)$ where n not in M: $w = C$, $C(C) = 3$,
$M = \{ D, E \} U \{ C \} = \{ C, D, E \}, (n) = [6 (C), 4 (E), 3 (E), 2, 9 (C)]$
Choose next smallest-cost entry: $w = B$, $C(B) = 4$,
$M = \{ C, D, E \} U \{ B \} = \{ B, C, D, E \}, C(n) = [6 (C), 4 (E), 3 (E), 2, 9 (C)]$
Choose next smallest-cost entry; $w = A$, $C(A) = 6$,
$M = \{B, C, D, E\} \cup \{A\} = \{A, B, C, D, E\}, C(n) = [6(C), 4(E), 3(E), 2, 9(C)]$
Choose next smallest-cost entry; $w = F$, $C(F) = 9$,
$M = \{A, B, C, D, E\} \cup \{F\} = \{A, B, C, D, E, F\}, C(n) = [6(C), 4(E), 3(E), 2, 9(C)]$

The loop terminates here because N = M. The routing table for D would look like this:

Dest	Cost	Next
		Нор
А	6	Е
В	4	Е
С	3	Е
Е	2	Е
F	9	Е

4.19 Given the following forwarding tables for nodes A and F, in a network where all links have cost 1, give a diagram of the smallest network consistent with those tables. (2)

Node	Cost	Next
rioue	0050	Нор
В	1	В
С	1	С
D	2	В
Е	3	С
F	2	С

Node	Cost	Next
		Нор
А	2	С
В	3	С
С	1	С
D	2	С
Е	1	Е



4.29 Given the following network, give the steps in the forward search algorithm as it builds the routing database for node A. (4)



Step	Confirmed	Tentative
1	(A,0,-)	
2	(A,0,-)	(B,1,B) (D,5,D)
3	(A,0,-)(B,1,B)	(D,5,D)
4	(A,0,-)(B,1,B)	(D,4,B) (C,7,B)
5	(A,0,-)(B,1,B)(D,4,B)	(C,7,B)
6	(A,0,-)(B,1,B)(D,4,B)	(C,5,B) (E,7,B)
7	(A,0,-)(B,1,B)(D,4,B)(C,5,B)	(E,7,B)
8	(A,0,-)(B,1,B)(D,4,B)(C,5,B)	(E,6,B)
9	(A,0,-) (B,1,B) (D,4,B) (C,5,B) (E,6,B)	