

**COE 444 - Internetwork Design and Management
Fall 2006 (Term 061)**

Homework 6

Date: Tuesday, December 5, 2006

Q1. Given a network with six nodes, labelled 0 to 5, with node 0 being the central backbone node. The cost of having a link between any two nodes is as indicated in the following cost matrix.

	0	1	2	3	4	5
0	0	7	8	11	14	17
1	7	0	6	5	10	12
2	8	6	0	10	7	14
3	11	5	10	0	8	8
4	14	10	7	8	0	9
5	17	12	14	8	9	0

Each of the nodes 1 -to- 5 generates 1 unit of flow to the backbone node. Only one type of link is available which can accommodate a maximum of 3 flow units.

- a. Find a minimum cost feasible spanning tree using Kruskal's algorithm.
- b. Find a minimum cost feasible spanning tree using Prim's algorithm.
- c. Find a minimum cost feasible spanning tree using Esau-Williams' algorithm.
- d. Discuss and compare the trees obtained with the above algorithms.

Note: For all algorithms you should show all the steps.

Q2. We would like to construct a minimum cost spanning tree connecting six workgroup switches to the main backbone switch (relay number 1). The flows from the various workgroup switches to the backbone are as follows:

Node Number	1	2	3	4	5	6
Flow in Mbps	-	10	15	5	15	10

Assume that there is a design constraint to have the flow on any link not to exceed 25 Mbps, and that the link costs are as follows:

	1	2	3	4	5	6
1	-	2	20	19	3	3
2	2	-	8	-	-	-
3	20	8	-	19	-	-
4	19	-	19	-	4	-
5	3	-	-	4	-	1
6	3	-	-	-	1	-

- a. Use Kruskal's algorithm to construct a minimum cost feasible spanning tree.
- b. Use Prim's algorithm to construct a minimum cost feasible spanning tree.
- c. Use Esau-William's algorithm to construct a minimum cost feasible spanning tree.
- d. Compare the cost of the trees obtained by the three heuristics. In your opinion, which heuristic is better? (You must justify your answer)

Note: For all algorithms you should show all the steps.