King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering
Department of Computer Engineering

COE 444 – Internetwork Design and Management (T092)

<u>Homework # 02 (*due date & time: Sunday 02/05/2010 during class period*)</u>

***** Show all your work. No credit will be given if work is not shown! *****

Problem # 1 (50 points): 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	10	17	9
1	7	0	6	5	10	12
2	8	6	0	11	14	7
3	10	5	11	0	8	8
4	17	10	14	8	0	14
5	9	12	7	8	14	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) (15 points)** Find a minimum cost feasible spanning tree using Kruskal's algorithm.
- **(b) (15 points)** Find a minimum cost feasible spanning tree using Prim's algorithm.
- **(c) (20 points)** Find a minimum cost feasible spanning tree using Esau-Williams' algorithm.

For each of parts (a) and part (b) provide the following:

1. List of the links included in the tree in the same order as they were added to the tree.
2. List of the links that were excluded due to creation of cycles.
3. List of the links that were excluded due to exceeding flow constraint.

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

Problem # 2 (50 points): 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	10	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	-	3	3	20	8	2
2	3	-	19	-	-	-
3	3	19	-	8	-	-
4	20	-	8	-	1	-
5	8	-	-	1	-	4
6	2	-	-	-	4	-

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