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

COE 444 – Internetwork Design and Management (T122)

Homework # 03 (*due date & time: Monday 22/04/2013 during class period*)

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

Problem # 1 (55 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 Mbps of flow to the backbone node. Only one type of link is available which can accommodate a maximum of 3 Mbps of flow.

- **(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) (25 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 (45 points): A company has 6 divisions, each serviced by a 10 Mbps Ethernet workgroup switch, labelled S_1 to S_6. The company has acquired three backbone switches B_1, B_2, and B_3, each with four interfaces. Two of these interfaces are 10 Mbps Ethernet interfaces, and the two others are 100 Mbps Fast Ethernet interfaces (i.e. **cannot** be used for 10 Mbps Ethernet connectivity).

Assume that the cost of connecting each of the workgroup switches to each of the backbone switches is as specified in the following cost matrix:

	B_1	B_2	B_3
S_1	2	5	9
S_2	8	3	4
S_3	3	1	5
S_4	2	6	9
S_5	2	7	3
S_6	1	5	9

Find a minimum cost feasible assignment of the workgroup switches to the backbone switches, and give the cost of such an optimum assignment.