

University of California  
Santa Barbara  
Department of Electrical and Computer Engineering

ECE 256A

Fall 2007.

Homework #1.

Please, type your homework solutions. This homework is due in class a week from today. You may submit your work electronically to [mms@ece.ucsb.edu](mailto:mms@ece.ucsb.edu) by 5pm.

1. Are the following statements right or wrong? For each statement, prove that it is correct, or construct a counter example, if it is wrong.

(a) If all arcs in a network have different lengths, then the shortest path tree from  $V_0$  to all the other nodes is unique.

(b) In an acyclic network, to find the longest path, we use  $d_{ij}' = k - d_{ij}$  where  $k$  is a large constant, and find the shortest path. Would this transformation work? Why?

(c) Partition a network into two parts and construct the minimum spanning tree for each part. Then connect the two parts by the shortest arc connecting two parts. The resulting tree is the minimum spanning tree for the whole network.

2. Analyze the covering algorithm presented in class (lecture notes #2). It produces a set of rows which cover a 1 in each column. Does this algorithm always find the minimum cardinality cover? Prove your statement.

3. If every node as well as every edge in a directed graph has a length, can you find the shortest path between two nodes?

4. Show that Dijkstra's algorithm may not work if edges can have negative lengths.