THE UNIVERSITY OF CALGARY
DEPARTMENT OF ELECTRICAL
AND COMPUTER ENGINEERING

ENEL 619.19 Assignment # 1 Fall 2003

Question 1: Graph Theory Definitions
In a few words explain the following definitions and give and example for each one of hem:

a. Vertex degree and Edge Degree

b. A complete graph

c. Bipartite graph

d. A route and a Path

e. A tree

f. A Hamiltonian path

g. Euler path

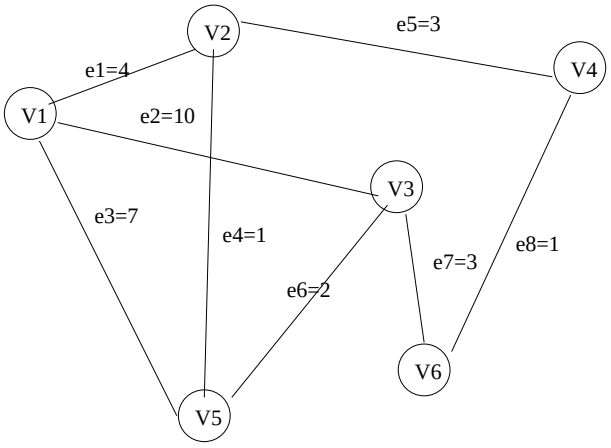
h. Graph clique

Question 2: Graph Theory Algorithms

a. For the weighted graph shown below, write the adjacency matrix. The rows of the adjacency matrix should represent the vertices in the graph and the columns should represent the edges.

b. Write a Matlab program to compute the shortest path using Dijkstra's method.

c. What is the shortest path from 1 to 6.

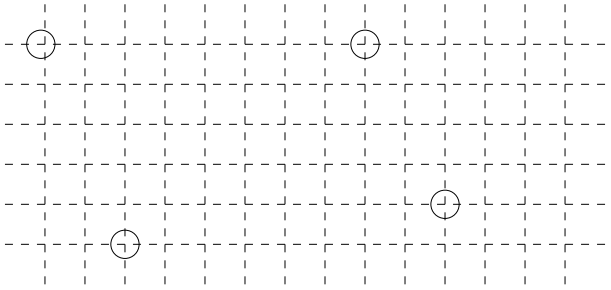


Question 3: Graph Theory Algorithms

For the figure shown in question #2, partition the circuit into two partitions of equal size such that the flow between the two partitions is minimized. Explain the method you have used.

Question 4: Graph Theory Algorithms

For the vertices shown here draw the Minimum Spanning Tree, Rectilinear Minimum panning Tree, Steiner Minimum Tree and the Rectilinear Steiner Minimum Tree.



Question 5: Modeling Graph Theory Problems as Optimization problems

Knapsack Problem A knapsack that can hold a total weight of $w = 30kg$ is available. Also hiking articles of n different type are available. Each article of type i has a weight of w_i and value v_i. The knapsack has to be loaded with these articles so as to maximize the value of the articles included, subject to it's weight capacity. Write this problem as an optimization problem.
Hint: Define variable x_j for each article. This variable is one is the article is included in the knapsack and is zero otherwise.