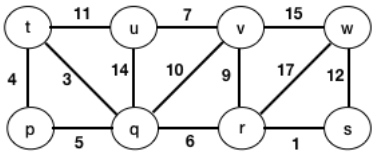
Problem 1. Using the following graph



apply Dijkstra's algorithm using vertex p as the source vertex. Write the vertices in a table, in the order in which they are marked. In another table report all distances at each step of the algorithm. The first row of the order of the marked vertices table and the first row of the distances table are shown below as well.

Marked Vertices

step	vertex
1	p

Distances

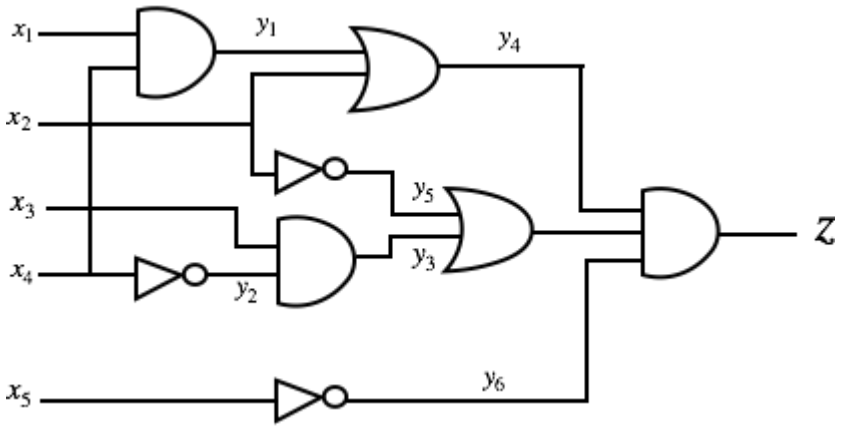
step	dist[p]	dist[q]	dist[r]	dist[s]	dist[t]	dist[u]	dist[v]	dist[w]
1	0	5	∞	∞	4	∞	∞	∞

Problem 2. Consider the following Boolean formula

$$((x_1 \wedge \overline{x_2}) \vee (x_1 \wedge x_3)) \wedge (x_2 \wedge \overline{x_3})$$

with assignment to the variables $x_1, x_2 \equiv TRUE, x_3 \equiv FALSE$. Evaluate the formula.

Problem 3. Consider the following Boolean circuit, with the assignment $x_1, x_3, x_5 \equiv TRUE$, $x_2, x_4 \equiv FALSE$. Evaluate the Boolean circuit. Show your work by indicating the truth value produced by each gate.



Problem 4. Suppose you work for this company that evaluates Boolean circuits in exponential time. Since you are very smart, your manager wants you to write some code that will solve these problems in polynomial time. You have no idea of how to solve this in polynomial time. You search on the internet but do not find anything. However, your roommate tells you that he just finished writing a program called, FormulaII, that solves a boolean formula in polynomial time and would let you use it. Now you are in a position to write a program to solve boolean circuits in polynomial time. Write high level pseudo-code(combination of english and pseudo-code) to solve Boolean circuits making use of your friend's code. What is the runtime of your algorithm to solve the Boolean circuits?

Problem 5. A clique in an undirected graph, G = (V,E) is a subset $V' \subseteq V$ of vertices each pair of which is connected by an edge in E. The size, k, of a clique is the number of vertices it contains. It is an NP-complete problem. Do the following:

(a) Write a decision version of this NP-complete problem.

(b) What is the certificate?

(c) Write pseudo-code to show that the clique $\in$ NP