CS 312: Algorithm Analysis

Homework Assignment #18

**Question 1** (4 points): Create the reduced cost matrix and the lower bound given the following distance matrix for the TSP problem.

\[
\begin{array}{cccc}
\infty & 7 & 3 & 12 \\
3 & \infty & 6 & 14 \\
5 & 8 & \infty & 6 \\
9 & 3 & 5 & \infty \\
\end{array}
\]

**Question 2** (6 points): For the following 4-city TSP problem assume that the initial BSSF is infinite and that the city cost/distance matrix is

\[
\begin{array}{cccc}
\infty & 7 & 3 & 12 \\
3 & \infty & 6 & 14 \\
5 & 8 & \infty & 6 \\
9 & 3 & 5 & \infty \\
\end{array}
\]

This is the same as problem 1 and the initial state should start with the same reduced cost matrix.

Use the partial path state search approach we discussed in class. This assumes the path starts at city 1, each node represents a city, and a link from a parent to a child node in the search space means a path between the cities. Expanding a node means generating a child state for each node to which the parent node has a path, creating its reduced cost matrix, and deciding if it goes on the queue or not.

Show the search tree that branch and bound would generate for this problem assuming the reduced cost matrix lower bound is used as the priority queue key. Show each state including the reduced cost matrix and bound. Also show when BSSF is updated and use it for proper pruning, etc.