1. The algorithm does not always construct a minimum spanning tree because for the graph

![Graph Image]

it would never even find a spanning tree.

2. **Conjecture 1** is false. For graph

![Graph Image]

the algorithm would return the path $v, z, w$, although the path $v, w$ is shorter.

**Conjecture 2** is true. Choose $v$ and $w$ such that the arc between $v$ and $w$ is a shortest arc in the graph. It will belong to a minimum spanning tree, and hence is the shortest path from $v$ to $w$ in the minimum spanning tree.

3. 

   $n \leftarrow 1$
   
   while $(x > T[n]) n \leftarrow 2^n;$
   
   $BinarySearch(T[(n/2) + 1..n], x)$

   The second and third instructions take time in $O(\log n)$. 