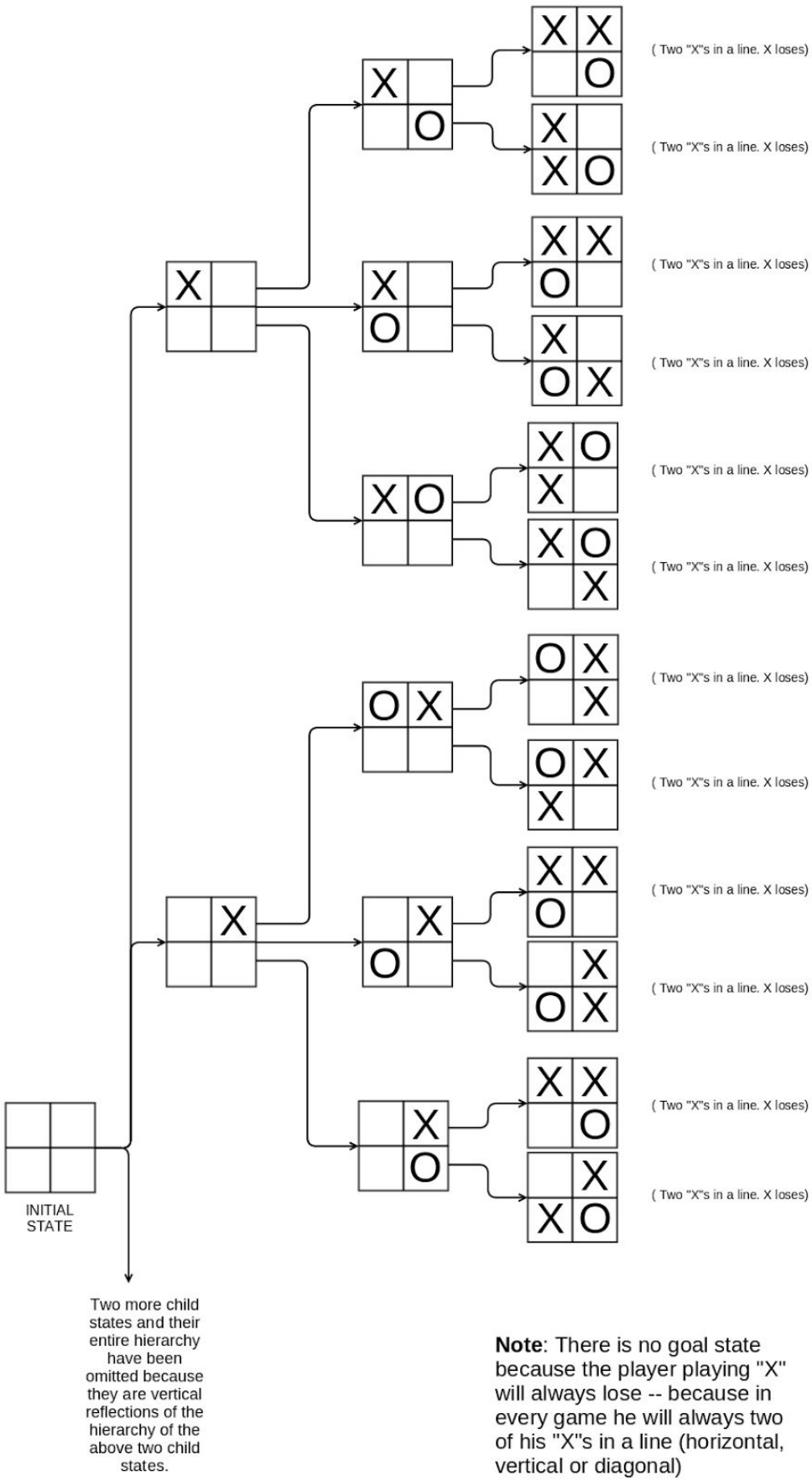
Question #1



Note: There is no goal state because the player playing "X" will always lose -- because in every game he will always two of his "X"s in a line (horizontal, vertical or diagonal)

Question #2:

Let us assume the state given below.

4	1	2
7	5	3
8		6

According the the given heuristic function of permutation inversions, the h(n) for the above state can be calculated as:

h(n) = P(1) + P(2) + P(3) + P(4) + P(5) + P(6) + P(7) + P(8)
= 0 + 0 + 0 + 3 + 1 + 0 + 3 + 1
= 8

This means that the heuristic function is estimating a total of 8 steps to get to the goal state.

However, if we apply the below shifts on the above state:
RIGHT -> DOWN -> DOWN -> LEFT -> LEFT -> UP -> UP,
we will reach the goal state in 7 steps.

Since the heuristic function over-estimates as “8” where the actual cost is only 7, the given function is not admissible (by the definition of an admissible function)