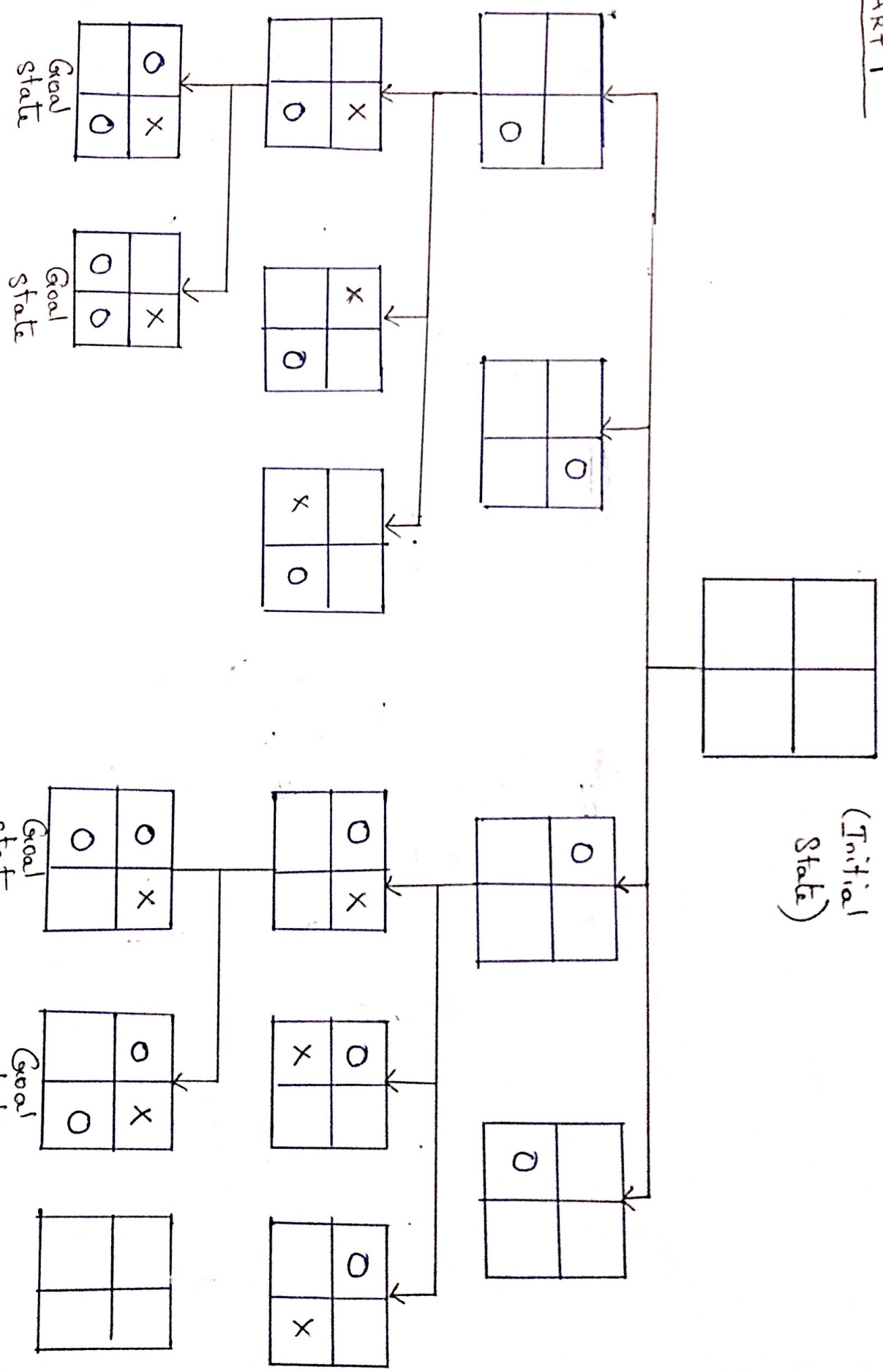


# Part 1

1.



The first player starts with 'O'.  
The first player reaches the goal state after two moves resulting in a 'loss' for two different paths as he completes in a row, column or diagonal.

## PART 1

2. Heuristic functions provide additional information to help us choose the optimum path when searching for a solution. In the case of the given problem for an 8 puzzle, the stated heuristic function is
- $$h(8) = \text{sum of permutation inversions}$$

### STATEMENT

A heuristic function is said to be admissible when it always provides the optimum cost without any over estimation.

TO PROVE/FIND

The aim is to identify if the heuristic function is admissible, that is, provides the cost without any over-estimation of the moves required to reach the goal state, from the start state and the goal state being

1	2	3
4	5	6
7	8	

## SOLUTION

If we could find any initial state for which the number of moves (cost) to reach the goal state estimated by  $h(s)$  is more than the actual number of moves to reach the goal state,  $h(s)$  would not be admissible. For initial state as below,

1	2	3
	8	5
4	7	6

$$h(s) = 0 + 0 + 0 + 4 + 1 + 0 + 1 + 0 = 6.$$

However, if we trace the moves to the goal state, the cost is only 5.

1	2	3
4	8	5
	7	6

1	2	3
4	8	5
7		6

1	2	3
4		5
7	8	6

1	2	3
4	5	
7	8	6

1	2	3
4	5	6
7	8	

Thus,  $h(s)$  is an overestimation and hence is not admissible.