

**Question** [2 marks]

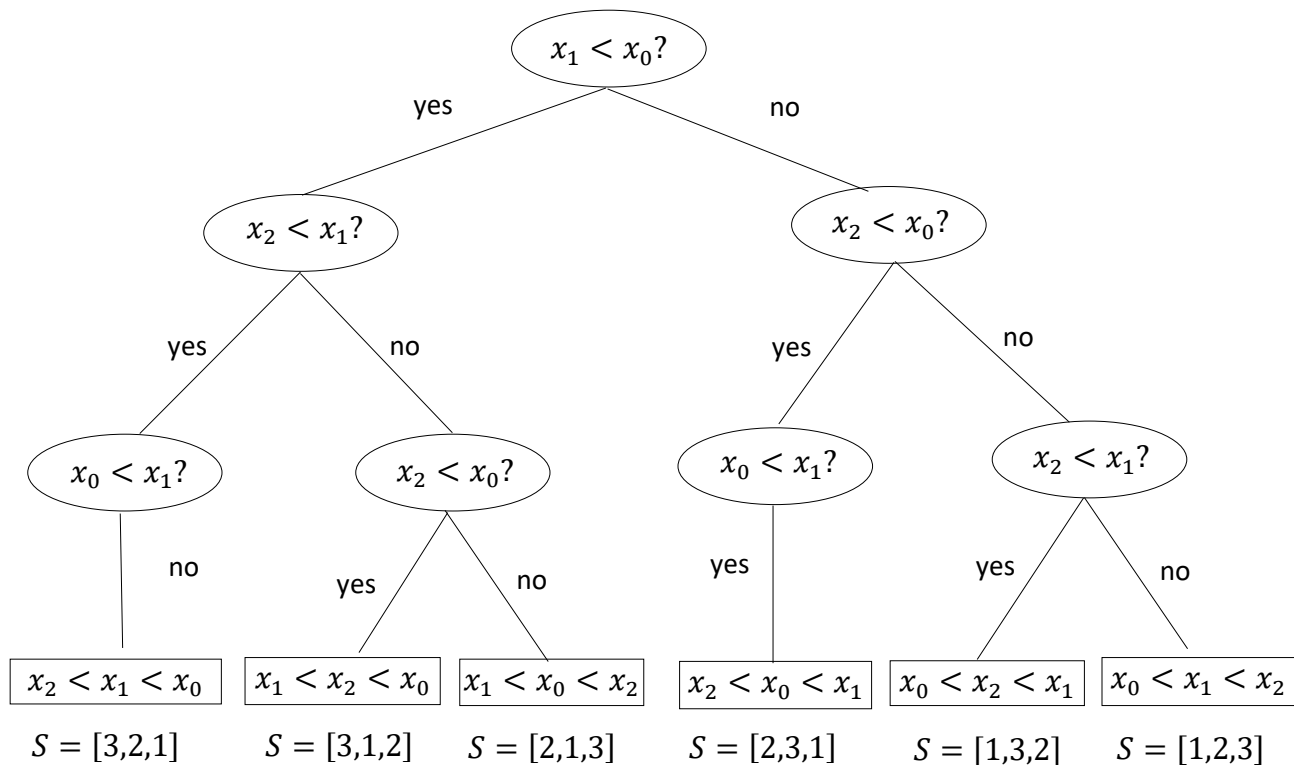
Consider a sequence of three distinct values, that we denote  $S = [x_0, x_1, x_2]$ . Using a **decision tree**, illustrate all the possible comparisons made by the **selection-sort algorithm**. Each comparison must be of the form  $x_i < x_j?$  and is a node in the tree whose left branch is the direction for “yes” and the right branch is for “no”. Assuming that each  $x_i \in \{1, 2, 3\}$ , label each of the external nodes in the decision tree with the particular permutation of sequence  $S$  associated with the path taken by the algorithm from the root to that node. (That is, label each leaf with the permutation associated with that leaf like we did in class).

**Algorithm** selectionSort( $A, n$ ):

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for  $k \leftarrow 0$  to  $n-2$  do
   $\text{min} \leftarrow k$ 
  for  $j \leftarrow k+1$  to  $n-1$  do
    if  $A[j] < A[\text{min}]$  then
       $\text{min} \leftarrow j$ 
    end
  end
  swap( $A[k], A[\text{min}]$ )
end

```



Note – I have trimmed two branches off, which lead to inconsistencies. For example, the left-most branch coinciding with a “yes” on the  $x_0 < x_1?$  node. This could not be true since we already know that  $x_0$  is not less than  $x_1$  from a previous test at the root.

Name:  
Student #:

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