W4.

a) The algorithm used is the greedy algorithm. The algorithm builds up the subset of A by making decisions based on whatever seems to be the best "in the moment". This decision occurs in Line 3 where the algorithm looks for the largest set in A containing the value x, however the rest of the values in that set may be redundant as the union of B may already contain it. Thus, only exploring some of the feasible solutions.

b) A = {{1}, {2}, {3}, {4}}
The set A produces the optimal solution using the algorithm above for any order in which the elements are considered and for any way of breaking ties. Since each of the sets contain unique values, they will all get selected in some order. Thus, producing the optimal and only possible solution.

c) A = {{0,4,5}, {1,4,5}, {2,4,5}, {3,4,5}, {0,1}, {2,3}, {4,5}}
The set A does not produce the optimal solution as it contains large sets (size 3) with redundant numbers and smaller sets (size 2) with unique numbers. However, since the algorithm searches for the largest set containing a value not yet included, it will always choose those first no matter the order in which they are considered. This deters the algorithm from producing the optimal solution as choosing the large sets creates redundancy of the numbers already included, rather than adding unique numbers to the union of the subset. In the end, the algorithm will always choose the 4 large sets to produce a subset that satisfies the union equality condition. Whereas, choosing the 3 small sets would be the most optimal. Therefore, the algorithm does not produce the optimal solution on set A.