**Topic 6.15: Generating All Subsets of a Set**

**Question**  
You are tasked with designing an efficient coding method to generate all subsets of a given set S containing n elements. Each subset should be outputted in lexicographical order. Return a list of lists where each inner list is a subset of the given set. Additionally, explain how your coding handles duplicate elements in S.

Example:  
For A = [1, 2, 3] the subsets are:

[], [1], [2], [3], [1, 2], [1, 3], [2, 3], [1, 2, 3]

**Aim**  
To implement an algorithm that generates all subsets of a given set in lexicographical order and analyze its behavior in the presence of duplicate elements.

**Algorithm**

1. Sort the input set to ensure lexicographical ordering of subsets.
2. Use backtracking:
   * Start with an empty subset.
   * At each step, choose whether to include the current element.
   * Recurse to the next element.
   * Append each generated subset to the result.
3. To handle duplicates:
   * If the set contains duplicate elements, skip duplicate branches to avoid generating identical subsets.
4. Return the final list of subsets.

**Output**A screenshot of a computer

AI-generated content may be incorrect.

**Result**  
The algorithm generates all subsets of the given set in lexicographical order. It can handle duplicates by applying checks to skip repeated elements.

**Performance Analysis**

* Time Complexity: O(2^n), since each element can either be included or excluded.
* Space Complexity: O(2^n) for storing all subsets and O(n) for recursion depth.