1. The Fibonacci numbers are defined as: $f_0=0$, $f_1=1$, and $f_i=f_{i-1}+f_{i-2}$ for i>1. Write both a recursive and an iterative C++ function to compute f_i. <20>

2. Determine the frequency counts for all statements in the following two program segments. <20>

```
1   for(i=1; i<=n; i++)
2     for(j=1; j<=i; j++)
3       for(k=1; k<=j; k++)
4         x++;
```

(a)

```
1   i=1;
2   while(i<=n)
3   {
4       x++;
5       i++;
6   }
```

(b)

3. Assume that the elements of the sets are the numbers 0, 1,…, 9. These elements are partitioned into three disjoint sets, $S_1=\{0, 6, 7, 8\}$, $S_2=\{1, 4, 9\}$, $S_3=\{2, 3, 5\}$.The data and array representations are given below. Write the class definition and constructor for sets, and the method for computing set union. <20>

Data presentation for S_1, S_2, S_3. Array presentation for S_1, S_2, S_3.

4. Given a string X of symbols, a substring of X is defined to be any contiguous portion of X. Using dynamic programming algorithm to identify longest common substring of both X and Y string. For example, if X=CCTTAGG and Y=AACTTAT, then CTTA is longest common substring between X and Y. What is the time complexity of your algorithm? <20>

5. Let w={5, 7, 10, 12, 15, 18, 20} and m=35. Write the recursive backtracking algorithm that can find all possible set of w that sum to m. Draw the portion of the state space that is generated. <20>