Assignment No: E-20

Aim: To study STL function to perform set operations

Problem Statement: To create ADT that implements the SET concept.
a. Add (newElement) -Place a value into the set
b. Remove (element) Remove the value
c. Contains (element) Return true if element is in collection
d. Size () Return number of values in collection Iterator () Return an iterator used to loop over collection
e. Intersection of two sets,
f. Union of two sets,
g. Difference between two sets,
h. Subset

Theory:

The Standard Template Library (STL) is a software library for the C++ programming language that influenced many parts of the C++ Standard Library. It provides four components called algorithms, containers, functional, and iterators.

The STL provides a set of common classes for C++, such as containers and associative arrays, that can be used with any built-in type and with any user-defined type that supports some elementary operations (such as copying and assignment). STL algorithms are independent of containers, which significantly reduces the complexity of the library.

The STL achieves its results through the use of templates. This approach provides compile-time polymorphism that is often more efficient than traditional run-time polymorphism. Modern C++ compilers are tuned to minimize abstraction penalty arising from heavy use of the STL.

At the core of the C++ Standard Template Library are following three wellstructured components:

Component	Description
Containers	Containers are used to manage collections of objects of a certain kind. There are several different types of containers like deque, list, vector, map etc.
Algorithms	Algorithms act on containers. They provide the means by which you will perform initialization, sorting, searching, and transforming of the contents of containers.
Iterators	Iterators are used to step through the elements of collections of objects. These collections may be containers or subsets of containers.

We will discuss about all the three C++ STL components in next chapter while discussing C++ Standard Library. For now, keep in mind that all the three components have a rich set of predefined functions which help us in doing complicated tasks in very easy fashion.

Let us take the following program demonstrates the vector container (a C++ Standard Template) which is similar to an array with an exception that it automatically handles its own storage requirements in case it grows:

```cpp
#include <iostream> #include
<vector>
using namespace std;

int main() {
   // create a vector to store int
   vector<int> vec;
   int i;

   // display the original size of vec
   cout << "vector size = " << vec.size() << endl;

   // push 5 values into the vector
for(i = 0; i < 5; i++){
      vec.push_back(i);
   }

   // display extended size of vec
   cout << "extended vector size = " << vec.size() << endl;

   // access 5 values from the vector
   for(i = 0; i < 5; i++){
      cout << "value of vec [" << i << "] = " << vec[i] << endl;
   }

   // use iterator to access the values
vector<int>::iterator v = vec.begin();    while(
v != vec.end()) {
      cout << "value of v = " << *v << endl;
v++;
   }

   return 0; }
```

Here are following points to be noted related to various functions we used in the above example:
⬚   The push_back( ) member function inserts value at the end of the vector, expanding its size as needed.
  • The size( ) function displays the size of the vector.
  • The function begin( ) returns an iterator to the start of the vector. ⬚ The function end( ) returns an iterator to the end of the vector.

Algorithm:
  1. Declare Header file   #include <set>, #include<algorithm> and #include<vector>
  2. Create a set to perform basic operation on set i.e. set<int> st;
  3. Create a vector to perform union, intersection and difference operation of set i.e. vector<int> v(10);
  4. Create iterator to access set and vector elements set<int>::iterator it; vector<int>::iterator it1;
  5. Perform following basic operation of set
          Insert Element into the Set
          Delete Element of the Set
          Size of the Set
          Find Element in a Set
          Display by Iterator
  6. Perform following basic operation of set using vector
          Union
          Interaction
          Difference
  7. Stop.

FAQ:
  1. Enlist standard library function to perform basic set operations?
  2. What is the use of iterator?
  3. What is use of vector?