C++ STANDARD TEMPLATE LIBRARY

III Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACSB06	**Core**	-	-	3	1.5	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes: 36**		

I. COURSE OVERVIEW:

This laboratory course emphasizes the Standard Template Library (STL) is a set of C++ template classes to provide common programming data structures and functions and is a library of lists, stacks, arrays. This laboratory course covers data structures and algorithms, and templates. Students will get a working knowledge of template classes of a Standard Template Library components. This course reaches to student which involve the problem solving in mathematical and engineering areas, MySql, Microsoft Windows Operating System programs.

II. Objectives:

The course should enable the students to:

I The C++ standard Template Libraries and the principles of object-orientedconcepts.

II The problem solving in mathematical and engineering areas, MySql, Microsoft Windows Operating System programs.

III The Different applications of vectors, maps, stacks, queue by using C++ standardtemplate libraries.

III. COURSE OVERVIEW:

After successful completion of the course, students should be able to:

CO 1 **Make use of** object oriented programming fundamentals for developing reusable software components. Apply

CO 2 **Apply** vectors , maps, sets, strings to design complex and efficientdata structures Apply

CO 3 **Make use of** Standard Template Library for stack and queue datastructures. Apply

CO 4 **Demonstrate** Standard Template Library components for arrays, lists, multisite, and multimaps computing problems. Apply

CO 5 **Implement** C++ STL programs for set operations, permutations, Lexicographical program design. Apply

CO 6 **Design** linked lists for queues, stacks, lists and dynamic memoryallocation. Create

IV. SYLLABUS:

LIST OF EXPERIMENTS

Week -1	CONTROL STRUCTURES

a. In this problem, you need to print the pattern of the following form containing the numbers from 1 to n.

```
4 4 4 4 4 4 4
4 3 3 3 3 3 4
4 3 2 2 2 3 4
4 3 2 1 2 3 4
4 3 2 2 2 3 4
4 3 3 3 3 3 4
4 4 4 4 4 4 4
```

Input:
2
Output:
2 2 2
2 1 2
2 2 2

b. Given a positive integer denoting n, do the following:
If 1<=n<=9, then print the lowercase English word corresponding to the number (e.g., one for , two for , etc.).
If n>9 , print Greater than 9.
Input:
5
Output:
five

Week -2	VECTORS AND MAPS

a. A left rotation operation on a vector of size N shifts each of the array's elements 1 unit to the left. For example, if 2 left rotations are performed on array [1,2,3,4,5], then the array would become[3,4,5,1,3 . Given an vector of n integers and a number, d , perform d left rotations on the array. Then print the updated array as a single line of space-separated integers. Print a single line of n space-separated integers denoting the final state of the array after performing d left rotations.
Sample Input
5 4
1 2 3 4 5
Sample Output
5 1 2 3 4

b. Prasad is working as teacher in one school. He evaluated exam papers for all students. He decided to store their marks in his computer using their names. Can you please suggest best data structure . For example
Marks["Ramu"]=98
Marks["Janu"]=87

Week -3	STACK AND QUEUE

a. You have an empty sequence, and you will be given queries. Each query is one of these three types:
1 x -Push the element x into the stack.
2   -Delete the element present at the top of the stack.
3   -Print the maximum element in the stack.
For each type 3 query, print the maximum element in the stack on a new line.
Sample Input
10
1 97
2
1 20
2
1 26
1 20
2
3
1 91
3

Sample Output
26
91

b. You must first implement a queue using two stacks. Then process queries, where each query is one of the 3 following types:

1 x: Enqueue element into the end of the queue.

2: Dequeue the element at the front of the queue.

3: Print the element at the front of the queue.

For each query of type , print the value of the element at the front of the queue on a new line.

Sample Input
10
1 42
2
1 14
3
1 28
3
1 60
1 78
2
2

Sample Output
14
14

Week -4	SETS AND STRINGS

a. You will be given Q queries. Each query is of one of the following three types:
   1. x : Add an element x to the set.
   2. x : Delete an element x from the set. (If the number is not present in the set, then do nothing).
   3. x : If the number x is present in the set, then print "Yes"(without quotes) else print "No"(without quotes).

For queries of type 3 print "Yes"(without quotes) if the number x is present in the set and if the number is not present, then print "No"(without quotes).

Each query of type 3 should be printed in a new line.

Sample Input
8
1 9
1 6
1 10
1 4
3 6
3 14
2 6
3 6

Sample Output
Yes
No
No

b. You are given a string containing characters A and B only. Your task is to change it into a string such that there are no matching adjacent characters. To do this, you are allowed to delete zero or more characters in the string.

Your task is to find the minimum number of required deletions.

	For example, given the string s=AABAAB, remove an A at positions 0 and 3 to make s=ABAB in 2 deletions.
Week -5	**SORTINGS AND PAIRS**

a. Raju and Ravi are friends. Raju asked Ravi to arrange the set of string in ascending order (Dictionary format). Please help the Ravi to put the strings in ascending order.
b. Teacher given a task to students find the unvisited elements in the given matrix. The students are struggling to find the unvisited elements in the list. Please help them to solve.

Week-6	**ARRAYS AND LISTS**

a. All friends are invited and they arrive at the party one by one in an arbitrary order. However, they have certain conditions — for each valid i, when the i-th friend arrives at the party and sees that at that point, strictly less than A_i other people (excluding Chef) have joined the party, this friend leaves the party; otherwise, this friend joins the party. Help Chef estimate how successful the party can be — find the maximum number of his friends who could join the party (for an optimal choice of the order of arrivals).

Input:
6
3 1 0 0 5 5
Output:
4

Week -7	**MULTISET AND MULTIMAPS**

a. Kattapa, as you all know was one of the greatest warriors of his time. The kingdom of Maahishmati had never lost a battle under him (as army-chief), and the reason for that was their really powerful army, also called as Mahasena. Kattapa was known to be a very superstitious person. He believed that a soldier is "lucky" if the soldier is holding an even number of weapons, and "unlucky" otherwise. He considered the army as "READY FOR BATTLE" if the count of "lucky" soldiers is strictly greater than the count of "unlucky" soldiers, and "NOT READY" otherwise. Given the number of weapons each soldier is holding, your task is to determine whether the army formed by all these soldiers is "READY FOR BATTLE" or "NOT READY".

Input:
4
11 12 13 14
Output:
NOT READY

Week -8	**UNORDERED SETS**

a. You are given two lists of N distinct numbers. Sort both the list and print them alternatively starting with list one.

Input:
7
5 4 3 6 2 1 7
15 14 13 16 12 11 17
Output:
1 11 2 12 3 13 4 14 5 15 6 16 7 17

Week -9	**SET UNION AND INTERSECTION**

a. A class contains two subjects and students can take one or two subjects as there wish. Here, students

opted subjects on there own interest. Now, your task is to print all the total students count and students names, and also print how many took two subjects and their names.

Input:

string first[] = { "John", "Bob", "Mary", "Serena" };

string second[] = { "Jim", "Mary", "John", "Bob" };

Output:

Total students: 6

Names: Neha Rakesh Sachin Sandeep Serena Vaibhav

Opted Two subjects: 3

Names: Bob John Mary

Week -10	IMPLEMENTATION OF QUEUE USING LINKED LIST

a. A class contains two subjects and students can take one or two subjects as there wish. Here, students opted subjects on their own interest. Now your task to find the student names who are attending first subject but not second and vice versa.

Input:

4

"John", "Bob", "Mary", "Serena"

4

"Jim", "Mary", "John", "Bob"

Output:

Attending First subject but not second: Serena

Attending Second subject but not first: Jim

Week -11	PERMUTATIONS

IARE college has designed a new challenge called BuildIT Competitive Programming. In this game, each team contains N members and they are specialised in either Java Programming or Python Programming. The challenge contains n1 java questions and n2 Python questions. So, team members are decided to seat in all specialized members as one group. So that, number of ways the N members seat in the programming contest.

For example: a team contains 'ab' java programmers and 'cde' python programmers

(a, b)   (c, d, e)
(b,a)   (c, e, d)
                (d, c, e)
                (d, e, c)
                (e, c, d)
                (e, d, c)

So, total ways are = 12

Sample Input:

ab cde

Sample Output:

abcde

abced

abdce

abdec

abecd

abedc

bacde

baced

badce

badec

baecd baedc	
Week -12	**LEXICOGRAPHICAL**

a. Ravi and Raju are best friends. Ravi given a set of strings to Raju and ask him to find smaller string as per lexicographical order. Please help him to find.

    For example:

    Input:

    4

    abacus

    apple

    car

    abba

    Output:

    abacus

Reference Books:

1. Bjarne Stroustrup , "Programming: Principles and Practice Using C++" 2nd Edition, 2014.
2. Herbert Schildt, "C++: The Complete Reference", 4th Edition, 2017.

Web References:

1. https://www.sanfoundry.com/cpp-programming-examples-stl/
2. https://www.geeksforgeeks.org/the-c-standard-template-library-stl/
3. https://www.tutorialspoint.com/cplusplus/cpp_stl_tutorial.htm
4. http://www.cplusplus.com/reference/stl/

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 60 STUDENTS:

HARDWARE:

Desktop systems: 30 nos

Printers: 02

SOFTWARE:

System Software: Windows 7.

Application Software's: MS Office.

Programming Languages: Borland C++ (open Source).