CET 214 – Data Structures & Algorithms

Experiment # 1

Experiment Title

Getting familiar with Data Structure & Algorithms

Assessment of CLO(s): IV

Performed on 20-09-2024

Student Name			
Roll No.		Group	
Semester		Session	

Total (Max)	Criteria 1 (2.5)	Criteria 2 (2.5)	Criteria 3 (2.5)	Criteria 4 (2.5)	Total (10)
Marks Obtained					
Remarks (if any)					

Experiment evaluated by

Instructor's Name	Engr. Muhammad Asad Husain		
Date		Signature	

Department of Engineering Technology
(UIT University)

Course Code: CET214 Course Title: Data Structures & Algorithms Course Credits: 2+1 Session: Fall 2024

Rubric for assessment criteria to perform experiment number 1.

Level / Criteria	UNSATISFACTORY 1	COMPETENT 2	PROFICIENT 3	DISTINGUISHED 4
Capability of writing algorithm/ Procedure	None of the steps are implemented of an algorithm.	Few steps are implemented correctly of an algorithm.	Most of the steps are implemented correctly of an algorithm.	All the steps are implemented correctly of an algorithm.
Capability of writing Program	Programs not completed.	Completeness of code, consistent variable naming and unformatted.	Completeness of code, inconsistent variable naming and well formatted.	Completeness of code, consistent variable naming and well formatted.
Completion of target in Lab	25% target has been completed	50% target has been completed	75% target has been completed	100% target has been completed
Output	None of the outputs are correct.	Few outputs have been found correctly.	Some of the outputs are correct and well formatted.	Most of the outputs are correct and well formatted.

Practical Objective(s):

1. Understand the concept of Data Structures.
2. Understand the concept of Algorithms.
3. How to develop logic from pseudo code.
4. Coding of Algorithm using C++.

Theory

Data Structures

Data may be organized in many different ways; the logical or mathematical representation of a particular organization of data is called a *data structure*. The choice of a particular data model depends on two considerations. First, it must be rich enough in structure to mirror the actual relationships of data in the real world. On the other hand, the structure should be simple enough that one can effectively process the data when necessary. Some of the widely used data structures are:

- Array
- Structure
- Linked List
- Stack
- Queue
- Tree
- Graph

Data Structure Operations

The data appearing in data structures are processed by means of certain operations. Some of the most frequently used operations are:

- Traversing
- Searching
- Inserting
- Deleting
- Sorting
- Merging

Algorithm

An algorithm is a well-defined list of steps for solving a particular problem. The problem can be a calculation, data processing, automated reasoning task etc. Algorithms tell the programmers how to code the program. A good algorithm suggests an efficient way of performing one or more of the operations mentioned above. Algorithm writing is a process and is executed after the problem domain is well-defined. That is, we should know the problem domain, for which we are designing a solution.

Example(s):

Example 1:

Algorithm 1: This algorithm receives two integers A and B from user, adds them and writes the sum in C.

Step 1. Read: A, B
Step 2. Set C=A+B
Step 3. Write: C
Step 4. Exit

Code:

```
#include <stdio.h>
#include <iostream>
using namespace std;

int main()
{
	int a,b,c;
	cout<<"Enter 1st Number: ";
	cin>>a;
	cout<<"Enter 2nd Number: ";
	cin>>b;

	c=a+b;
	cout<<"Sum is "<<c<<"\n";

	system ("pause");
	return 0;
}
```

Example 2:

Algorithm 2: This algorithm receives an integer N from user and calculates its multiplication table up to 10. The variable K is used as a counter.

Step 1. [Initialize] Set K:=1
Step 2. Read: N
Step 3. Repeat Step 4 and 5 while K<=10:
Step 4. Write: N, K, N*K
Step 5. K=K+1
[End of Step 3 loop]
Step 6. Exit

Code:

```
#include <stdio.h>
#include <iostream>
using namespace std;

int main()
{
      int n;
      int k=1;

      cout<<"Enter Number: ";
      cin>>n;

      while (k<=10)
      {
          cout<<n<<"x"<<k<<"="<<(n*k)<<"\n";
          k=k+1;
      }

      system ("pause");
      return 0;
}
```

Task(s):

1. Write an algorithm and a C++ program to calculate factorial of a given number.
2. Write an algorithm and C++ program that takes two parameters as input and return the swap of the two input values.
3. Write an algorithm and C++ program to find the size of Data Types (integer, float, character).
4. Write an algorithm and C++ program to convert the Celsius Value to Fahrenheit.

Question(s):

Answer True or False for these statements:

1. Array is a data structure operation. _____ (True/False)
2. Stacks, queue and trees are types of data structures. _____ (True/False)
3. An algorithm written for C++ will be completely different than the one for any other language. _____ (True/False)
4. Traversing means visiting each element of a data structure in order to perform a certain operation. _____ (True/False)
5. Choice of a data structure for a particular scenario depends on the nature of data. (True/False)