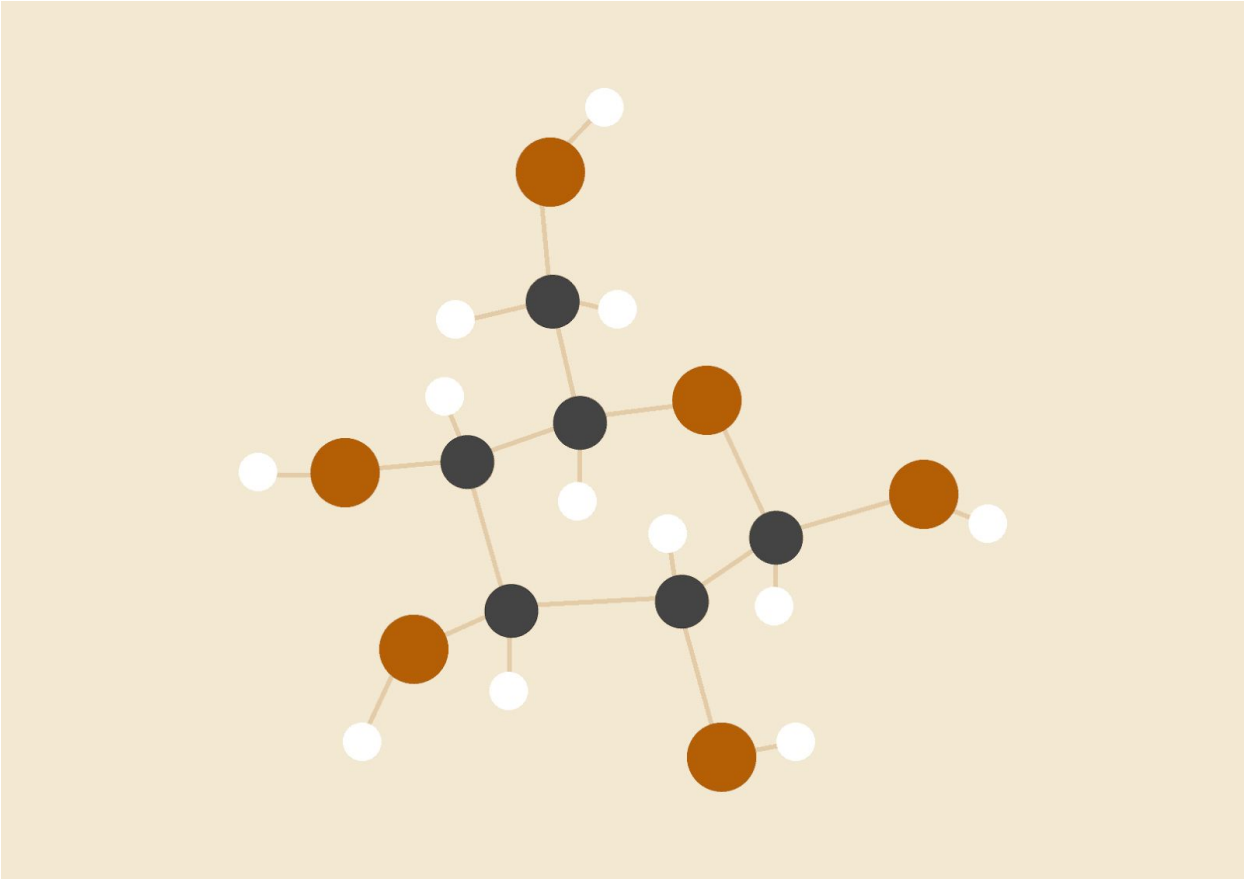
ASSIGNMENT 4

Data Structures Laboratory



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BTech CSE

Problem Statement 1:

Create a dictionary using Trie data structure (without using STL) having words and their meanings. You need to read the words and their respective meanings from a CSV file (uploaded in Piazza, named as TrieInput.csv), where 1st column is for words and 2nd column shows its meaning. Given a word you have to print its meaning. If no such word is found in the dictionary, then print “Invalid word”. Create a GUI using Qt library to accept a word in a text box and display the meaning in an another box, as shown in the Figure 1. Also, create an installer of your program for Windows OS. You can use the software like InstallSimple or InstallShield or WIX or NSIS to do so.

Algorithms and Implementation:

- Trie Data structure has been implemented with simple insert and search functions
- The Dictionary is searched when either ENTER is pressed of Search Button of the gui is used.
- QT Creator environment has been used to create the application.A GUI was designed inside QT Creator.
- InstallSimple was used to create an installer of the executable file that constitutes the dictionary

Problem Statement 2:

Implement N Queens problem to show all the possible combinations in N x N binary matrix and to display the total number of such combinations at the end, where 1 represents the position of N queens in the N x N matrix and remaining cells are represented by 0.

Algorithms and Implementation:

- Recursion was used to solve the problem where each configuration was recursively built and checked for its feasinbility.
- BackTracking Technique was used to reduce the implementation time.
- In this technique,if a particular orientation fails we dont have to start all over again,we already have it in the recursion tree and can use it from there
- Git was used as version control
- GDB was used for debugging

Problem Statement 3:

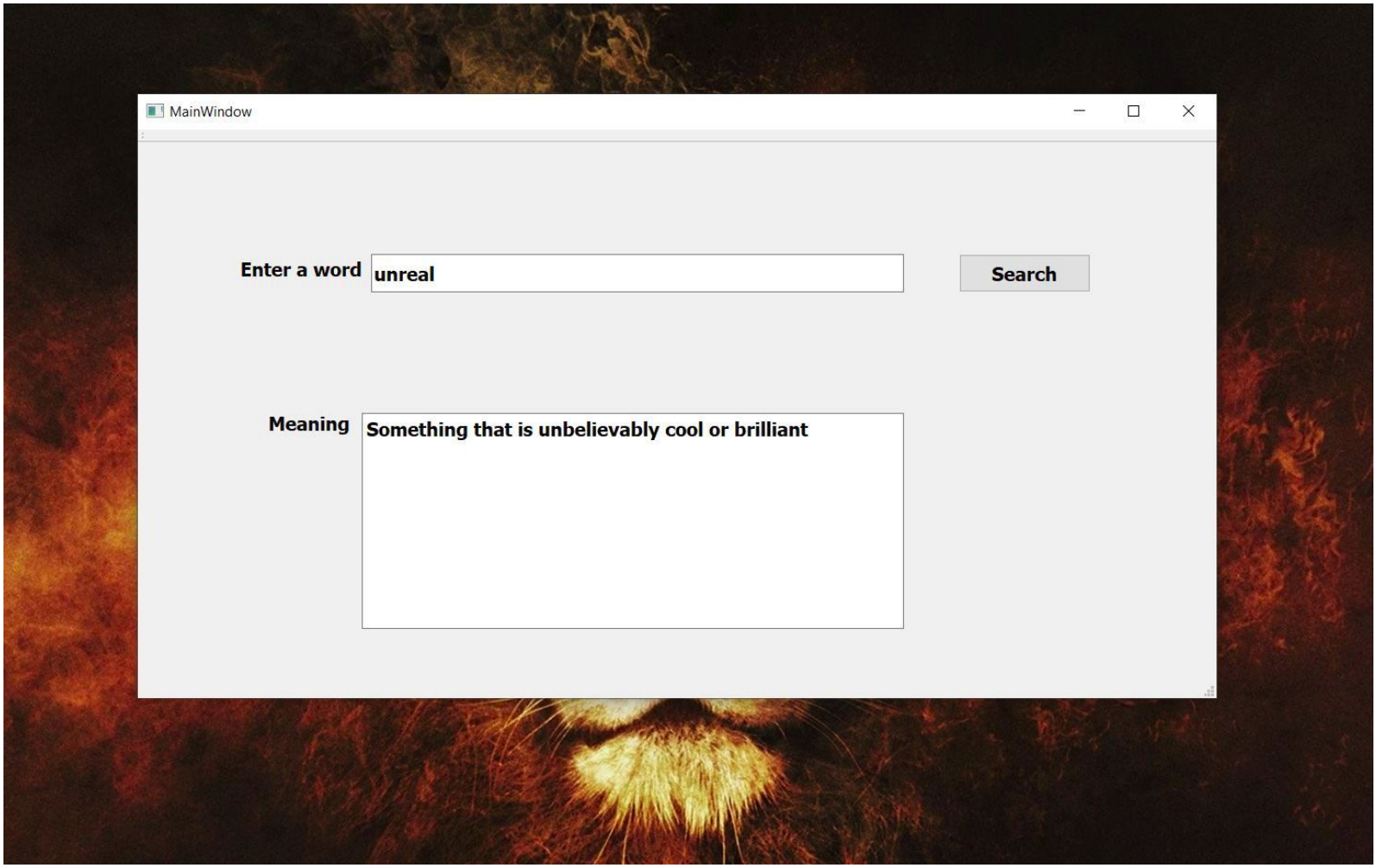
Given an integer array having N number of elements, write a C++ program using hash map (using STL) to find the length of the largest subarray from the given input array, where the summation of the elements of the subarray is equal to n. In the output, if any solution exists then print the starting and ending index (with respect to given input array) of the largest subarray and also print its length. Otherwise, print “Not Found”, as described in the following output.

Algorithms and Implementation:

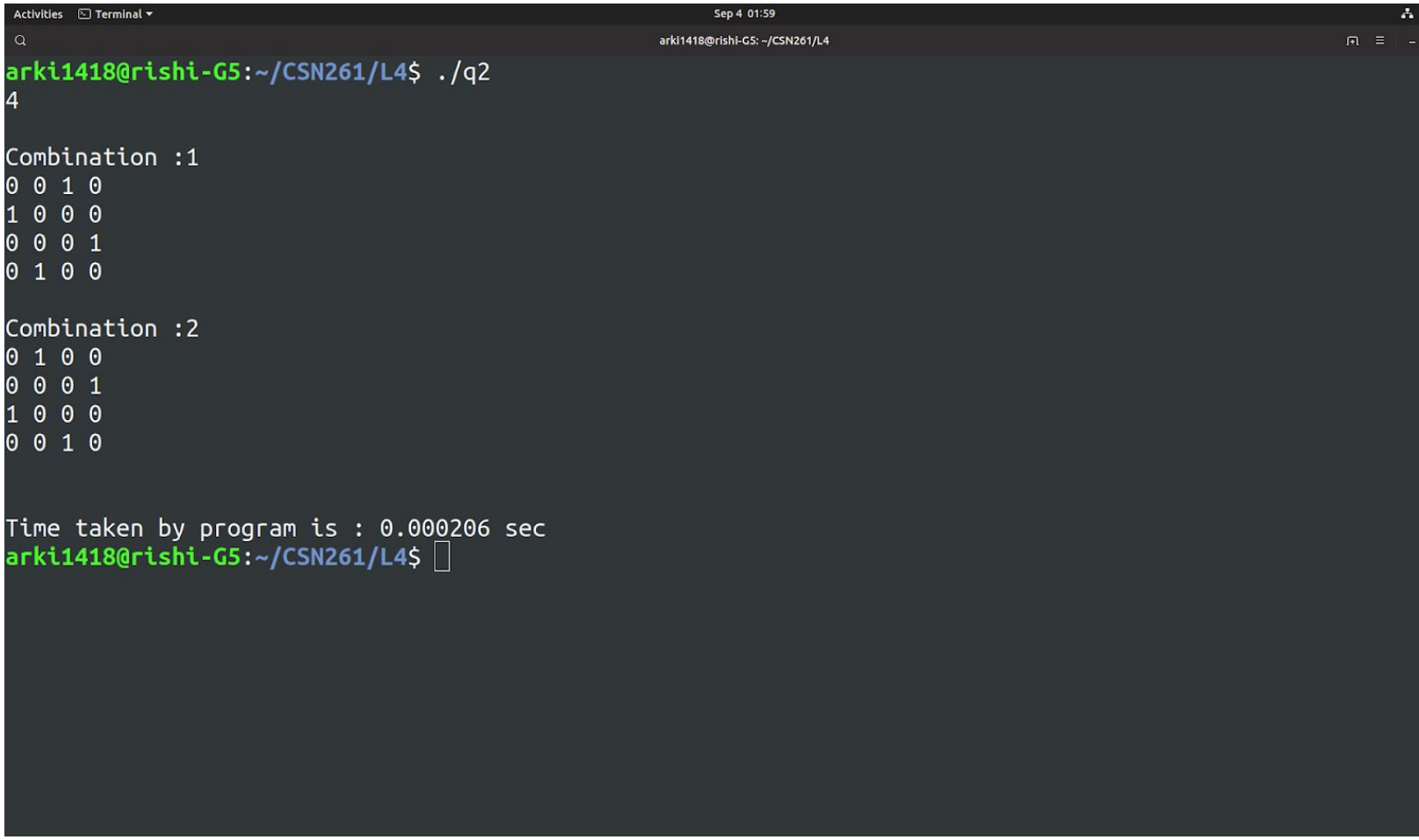
- Simple hash table from the Standard c++ libraries are used.
- The main algorithm includes storing the prefix sum in the hash table in O(n).Now we check if sum occurs for any prefix or not. We also check if Sum(at a given index) - the actual sum exists or not. The maximum length is taken among them
- Git was used as version control
- GDB was used for debugging

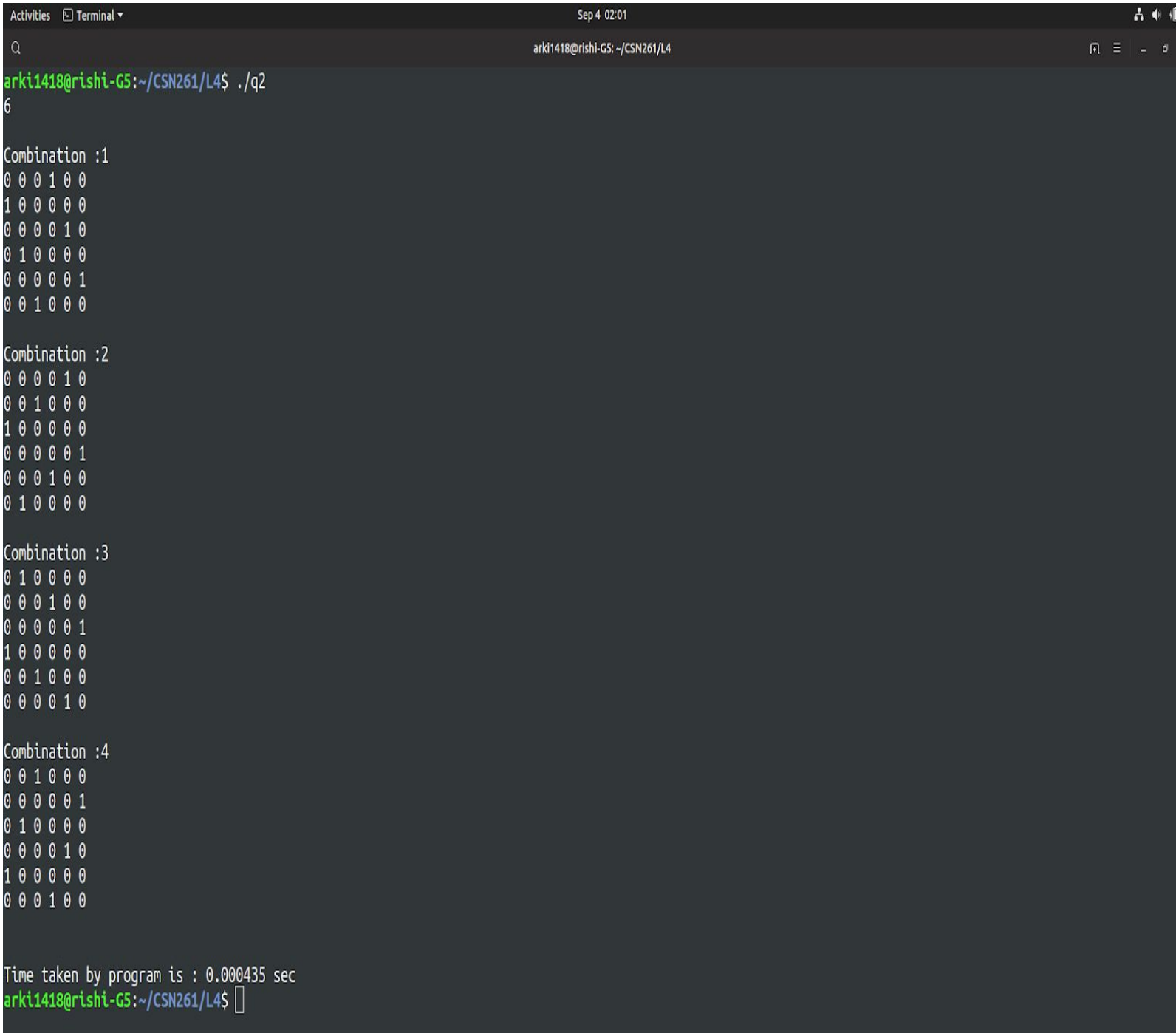
Snapshots and Computation Time

Question 1:



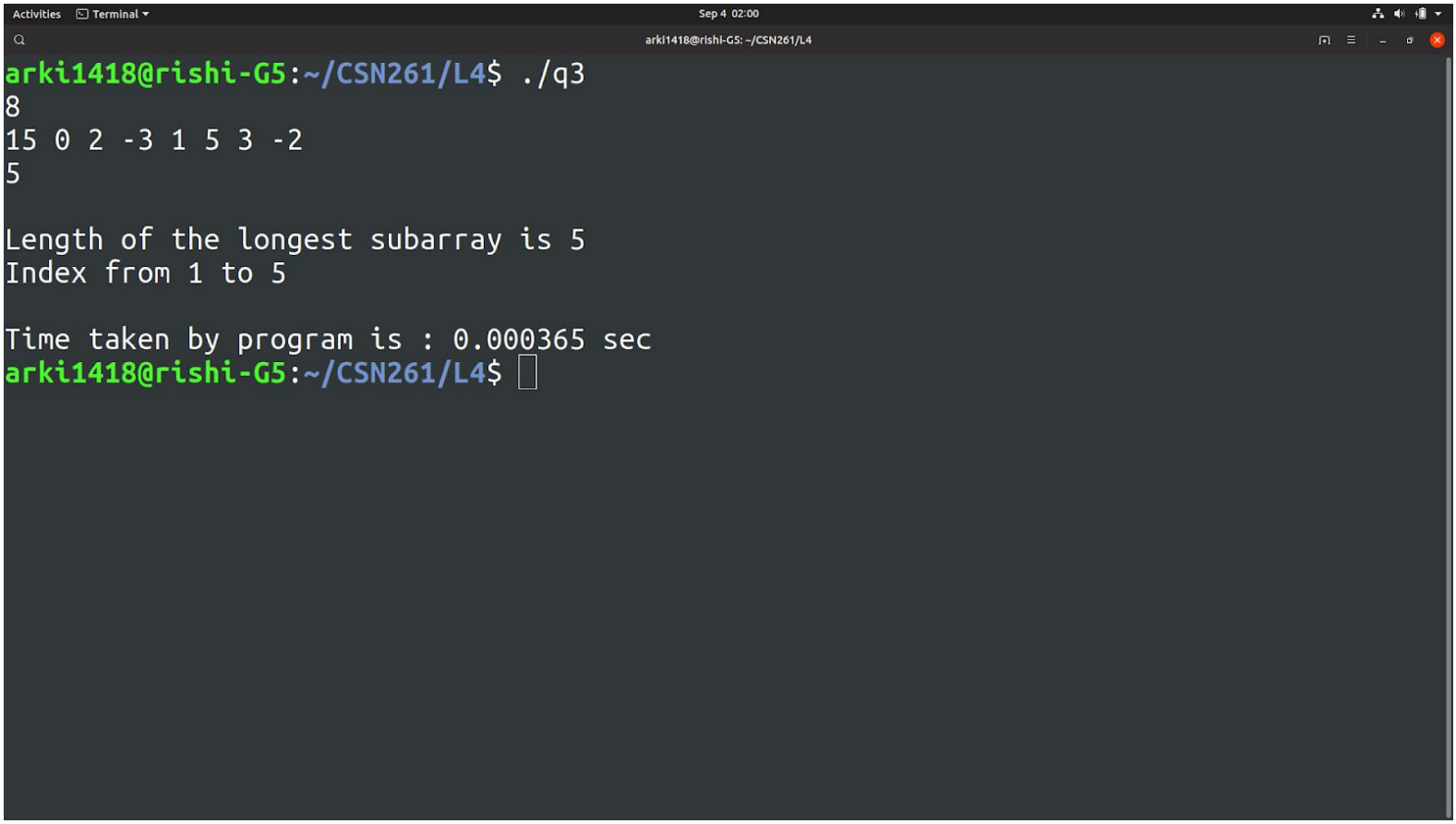
Question 2:


Activities
Terminal
Sep 4 01:59
arki1418@rishi-G5: ~/CSN261/L4
arki1418@rishi-G5:~/CSN261/L4$ ./q2
4
Combination :1
0 0 1 0
1 0 0 0
0 0 0 1
0 1 0 0
Combination :2
0 1 0 0
0 0 0 1
1 0 0 0
0 0 1 0
Time taken by program is : 0.000206 sec
arki1418@rishi-G5:~/CSN261/L4$


Activities
Terminal
Sep 4 02:01
arki1418@rishi-G5: ~/CSN261/L4
arki1418@rishi-G5:~/CSN261/L4$ ./q2
6
Combination :1
0 0 0 1 0 0
1 0 0 0 0 0
0 0 0 0 1 0
0 1 0 0 0 0
0 0 0 0 0 1
0 0 1 0 0 0
Combination :2
0 0 0 0 1 0
0 0 1 0 0 0
1 0 0 0 0 0
0 0 0 0 0 1
0 0 0 1 0 0
0 1 0 0 0 0
Combination :3
0 1 0 0 0 0
0 0 0 1 0 0
0 0 0 0 0 1
1 0 0 0 0 0
0 0 1 0 0 0
0 0 0 0 1 0
Combination :4
0 0 1 0 0 0
0 0 0 0 0 1
0 1 0 0 0 0
0 0 0 0 1 0
1 0 0 0 0 0
0 0 0 1 0 0
Time taken by program is : 0.000435 sec
arki1418@rishi-G5:~/CSN261/L4$

Question 3:


Activities
Terminal
Sep 4 02:00
arki1418@rishi-G5: ~/CSN261/L4
arki1418@rishi-G5:~/CSN261/L4$ ./q3
4
1 2 3 4
7
Length of the longest subarray is 2
Index from 2 to 3
Time taken by program is : 0.000341 sec
arki1418@rishi-G5:~/CSN261/L4$


Activities
Terminal
Sep 4 02:00
arki1418@rishi-G5: ~/CSN261/L4
arki1418@rishi-G5:~/CSN261/L4$ ./q3
8
15 0 2 -3 1 5 3 -2
5
Length of the longest subarray is 5
Index from 1 to 5
Time taken by program is : 0.000365 sec
arki1418@rishi-G5:~/CSN261/L4$