UNIVERSITY INSTITUTE OF ENGINEERING

Department of Computer Science & Engineering

Subject Name: DAA Lab

Subject Code: 20ITP-312

Submitted to:

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Group: A

Worksheet Experiment – 2.2

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Subject: DAA Lab

1. Aim/Overview of the practical:

To implement subset-sum problem using Dynamic Programming .

2. Task to be done/ Which logistics used:

find whether or not there exists any subset of the given set .

3. Algorithm/Flowchart:

i. We create a boolean subset[][] and fill it in bottom up manner.

ii. The value of subset[i][j] will be true if there is a subset of set[0..j-1] with sum equal to i., otherwise false.

iii. subset[i][j] = true if there is a subset with:

iv. the i-th element as the last element * sum equal to j

v. subset[i][0] = true as sum of {} = 0 vi. subset[0][j] = false as with no elements we can get no sum vii. subset[i][j] = subset[i-1][j-E1]; where E1 = array[i-1] viii. Finally, we return subset[n][sum].

4. Steps for experiment/practical/Code:

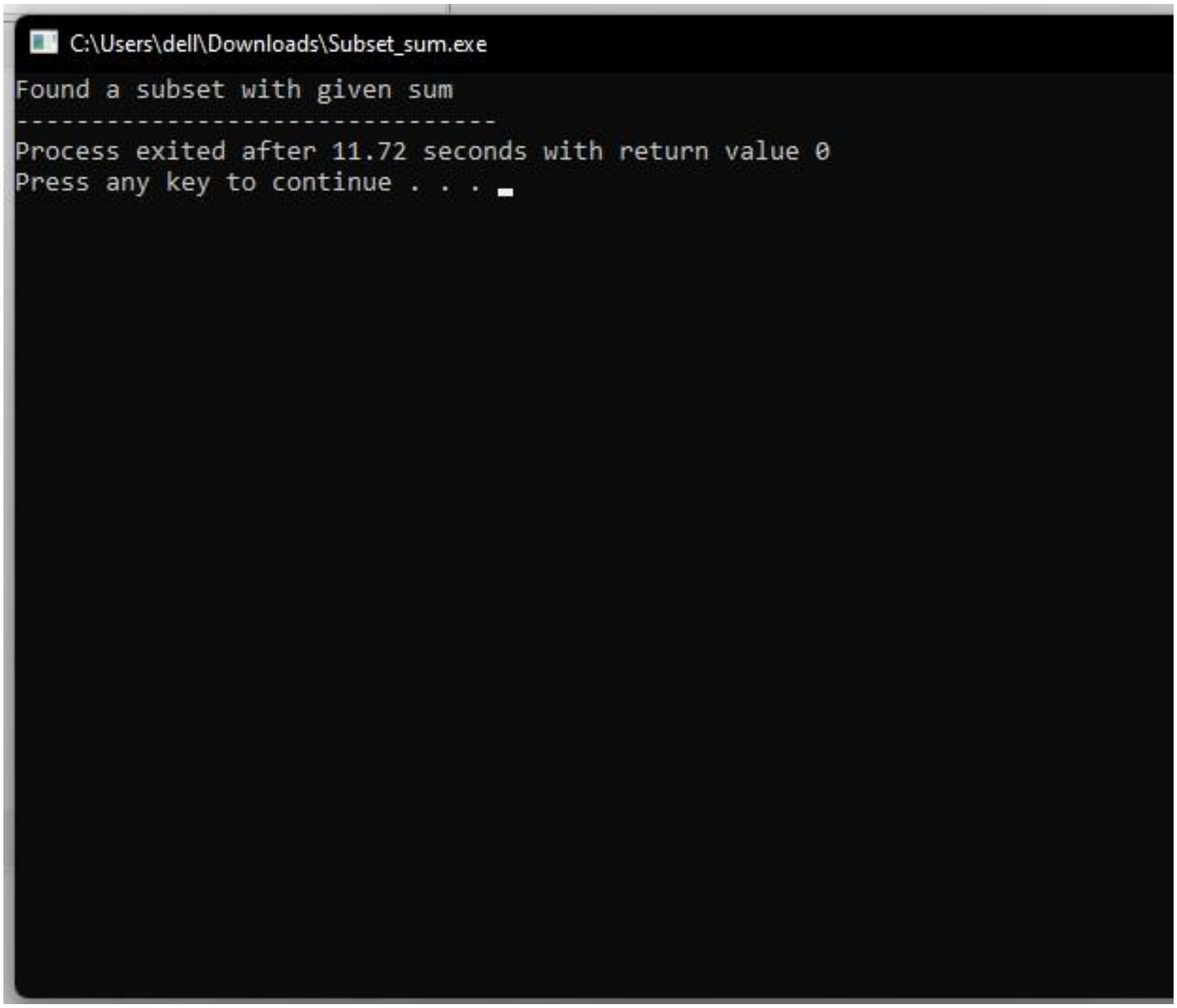
```
#include<iostream>
using namespace std;

 bool subsetsum_DP(int a[],int n, int sum)
 {
    bool dp[n+1][sum+1];
    int i,j;
    for(i=0;i<=n;i++)
      dp[i][0]=true;

    for(j=1;j<=sum;j++)
      dp[0][j]=false;

    for(i=1;i<=n;i++)
    {
      for(j=1;j<=sum;j++)
      {
        if(dp[i-1][j]==true)
dp[i][j]=true;
        else         {
if(a[i-1]>j)
dp[i][j]=false;
          else
            dp[i][j]=dp[i-1][j-a[i-1]];
        }
      }
    }
    return dp[n][sum];
   }
int main() {
  int set[] = { 3, 34, 4, 12, 5, 2 };
int sum = 9;
  int n = sizeof(set) / sizeof(set[0]);     if
(subsetsum_DP(set, n, sum) == true)
cout <<"Found a subset with given sum";
else
    cout <<"No subset with given sum";
return 0;
}
```

5. Observations/Discussions/ Complexity Analysis:

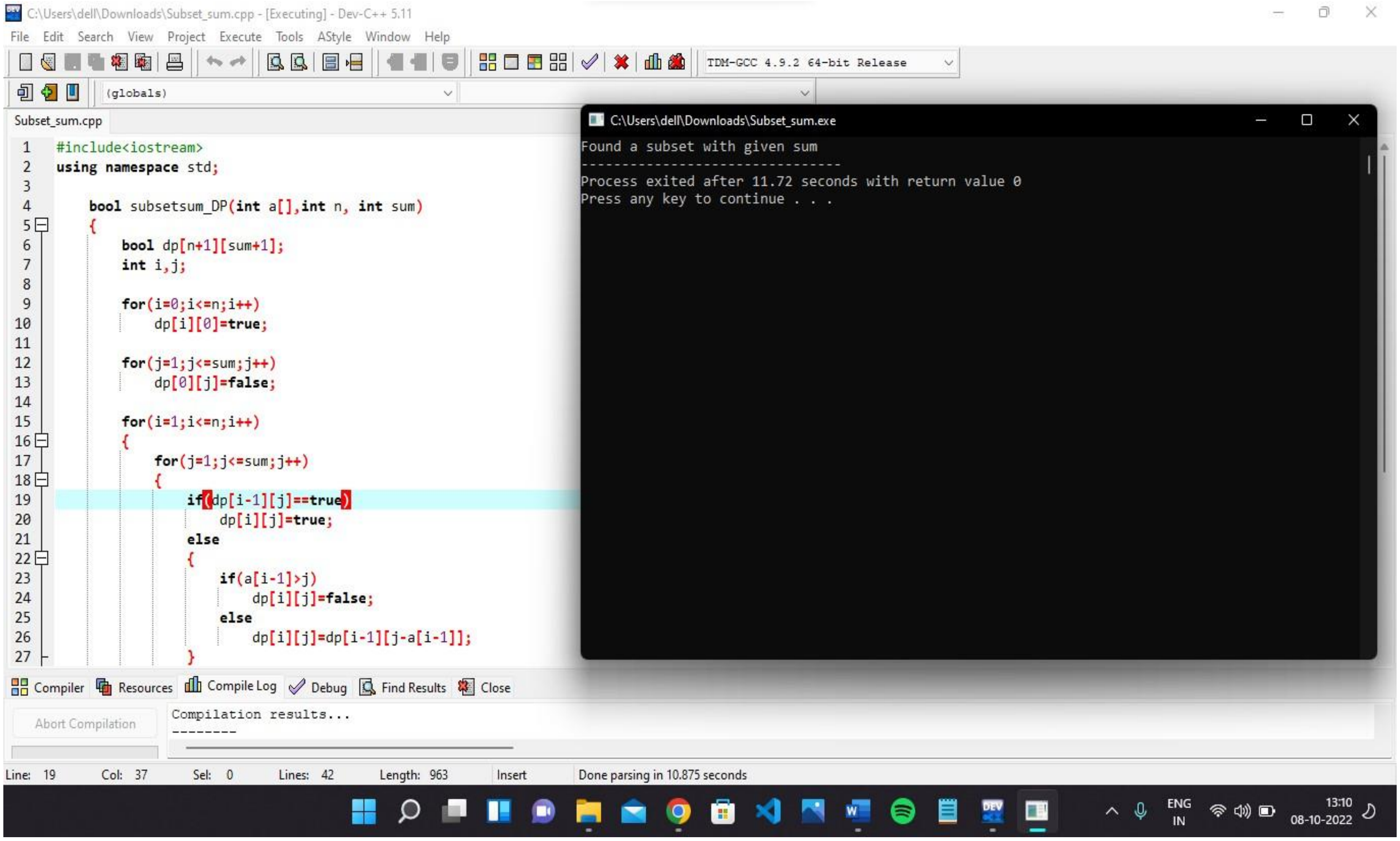
- Worst case time complexity: Θ(n*sum)

- Space complexity: Θ(sum)

6. Result/Output/Writing Summary:



```
Found a subset with given sum
--------------------------------
Process exited after 11.72 seconds with return value 0
Press any key to continue . . .
```



C:\Users\dell\Downloads\Subset_sum.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Release
(globals)
Subset_sum.cpp
C:\Users\dell\Downloads\Subset_sum.exe
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Line: 19 Col: 37 Sel: 0 Lines: 42 Length: 963 Insert Done parsing in 10.875 seconds
ENG IN 13:10 08-10-2022

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

    bool subsetsum_DP(int a[],int n, int sum)
    {
        bool dp[n+1][sum+1];
        int i,j;

        for(i=0;i<=n;i++)
            dp[i][0]=true;

        for(j=1;j<=sum;j++)
            dp[0][j]=false;

        for(i=1;i<=n;i++)
        {
            for(j=1;j<=sum;j++)
            {
                if(dp[i-1][j]==true)
                    dp[i][j]=true;
                else
                {
                    if(a[i-1]>j)
                        dp[i][j]=false;
                    else
                        dp[i][j]=dp[i-1][j-a[i-1]];
                }
```

```
Found a subset with given sum
--------------------------------
Process exited after 11.72 seconds with return value 0
Press any key to continue . . .
```

```
Compilation results...
--------
```

Learning Outcomes:-

1. Create a program keeping in mind the time complexity
2. Create a program keeping in mind the space complexity
3. Steps to make optimal algorithm
4. Learnt about how to implement subset sum problem using dynamic programming.