IT300 – Design and Analysis of Algorithms

Lab Assignment – 6

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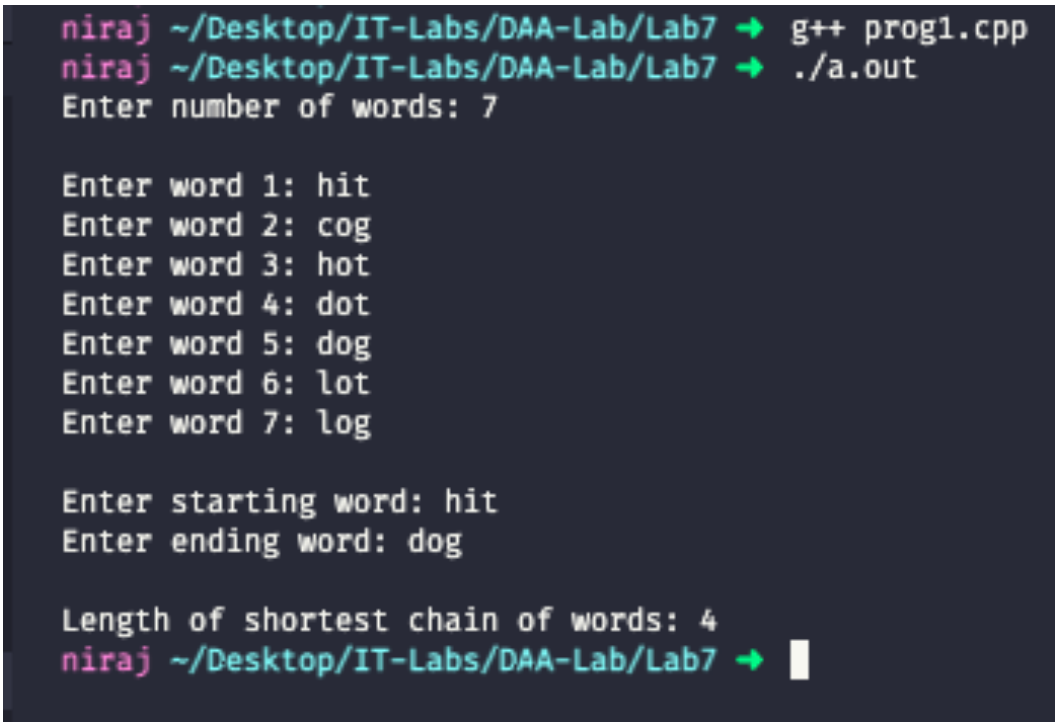
1. Program 1
    a. Code

```
#include <iostream>
#include <queue>
#include <set>
#include <stdio.h>

using namespace std;

int shortestChainLength(string start, string end, set<string> wordDict)
{
  if (start == end || wordDict.find(end) == wordDict.end())
  {
    return 0;
  }

  int lvl = 0, wLen = start.size(), size;
  string word;
  char orig_char;
  queue<string> Q;

  Q.push(start);
  while (!Q.empty())
  {
    lvl++;
    size = Q.size();
    for (int i = 0; i < size; i++)
    {
      word = Q.front();
      Q.pop();
      for (int pos = 0; pos < wLen; ++pos)
      {
        orig_char = word[pos];
        for (char c = 'a'; c <= 'z'; ++c)
        {
          word[pos] = c;
          if (word == end)
          {
            return lvl + 1;
          }
          if (wordDict.find(word) == wordDict.end())
```

```
          {
            continue;
          }
          Q.push(word);
          wordDict.erase(word);
        }
        word[pos] = orig_char;
      }
    }
  }

  return 0;
}

int main()
{
  int n;
  string start, end, temp;
  set<string> wordDict;

  cout << "Enter number of words: ";
  cin >> n;
  cout << endl;

  for (int i = 0; i < n; i++)
  {
    cout << "Enter word " << i + 1 << ": ";
    cin >> temp;
    wordDict.insert(temp);
  }

  cout << "\nEnter starting word: ";
  cin >> start;
  cout << "Enter ending word: ";
  cin >> end;
  cout << "\nLength of shortest chain of words: " << shortestChainLength(start, end, wordDict) <<
endl;

  return 0;
}
```

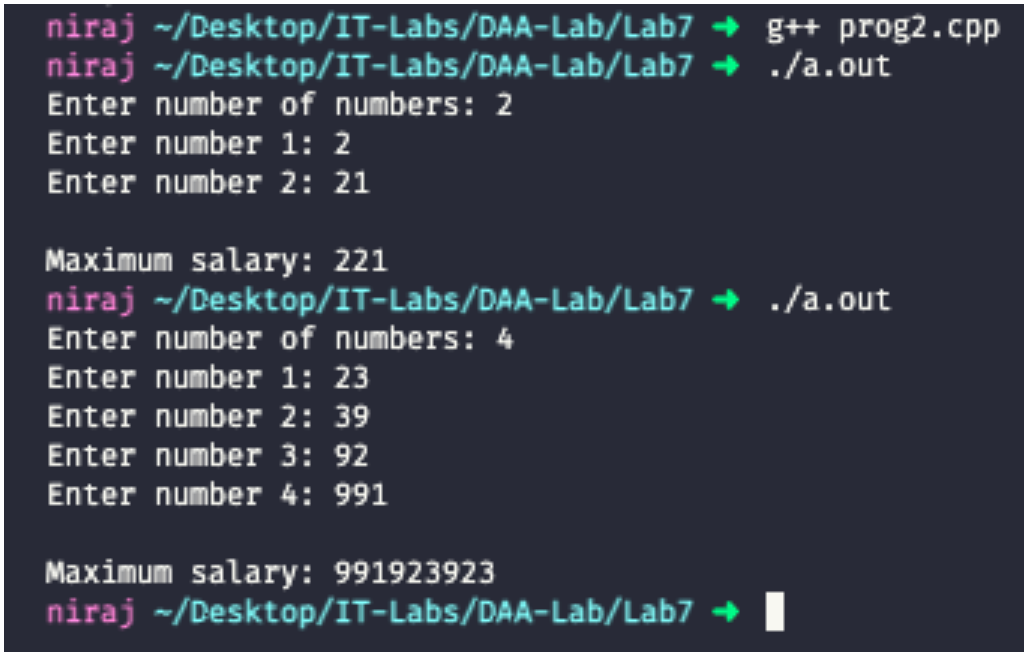
b. Screenshots



2. Program 2
    a. Code

```cpp
#include <iostream>
#include <stdio.h>
#include <vector>

using namespace std;

bool compFunc(string x, string y)
{
  string YX = y.append(x);
  string XY = x.append(y);
  return XY.compare(YX) > 0 ? 1 : 0;
}

void maxSalary(vector<string> inpArr)
{
  sort(inpArr.begin(), inpArr.end(), compFunc);
  for (int i = 0; i < inpArr.size(); i++)
  {
    cout << inpArr[i];
  }
}

int main()
{
  int n, inp[n];
  string temp;
  vector<string> inpArr;

  cout << "Enter number of numbers: ";
  cin >> n;

  for (int i = 0; i < n; i++)
  {
    cout << "Enter number " << i + 1 << ": ";
    cin >> temp;
    inpArr.push_back(temp);
  }

  cout << "\nMaximum salary: ";
  maxSalary(inpArr);
  cout << endl;

  return 0;
}
```

b. Screenshots



3. Program 3
    a. Code

```cpp
#include <iostream>
#include <stdio.h>

using namespace std;

void minRefills(int d, int m, int n, int gas[])
{
  int refills = 0, curr = 0, limit = m;
  while (limit < d)
  {
    if (curr >= n || gas[curr] > limit)
    {
      cout << "-1" << endl;
      return;
    }
    while (curr < n - 1 && gas[curr + 1] <= limit)
    {
      curr++;
    }
    refills++;
    limit = gas[curr] + m;
    curr++;
  }
  cout << refills << endl;
}

int main()
{
  int d, m, n, gas[n];
  cout << "Enter distance of your destination: ";
  cin >> d;
  cout << "Enter max distance your car can travel on a full tank: ";
  cin >> m;
  cout << "Enter number of gas stations: ";
  cin >> n;
  cout << endl;

  for (int i = 0; i < n; i++)
  {
    cout << "Enter distance of gas station " << i + 1 << ": ";
    cin >> gas[i];
  }

  cout << "\nMinimum number of refills: ";
  minRefills(d, m, n, gas);

  return 0;
}
```

b. Screenshots