Experiment-3.2

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Subject Name: Competitive Coding II **Subject Code: 20CSP- 351**

Aim – To demonstrate the concept of backtracking

Objective-

- The objective is to build problem solving capability and to learn the basic concepts of data structures.
- The implementation of binary watch using backtracking.
- The implementation of word ladder II.

1) Binary Watch

https://leetcode.com/problems/binary-watch/

Code –

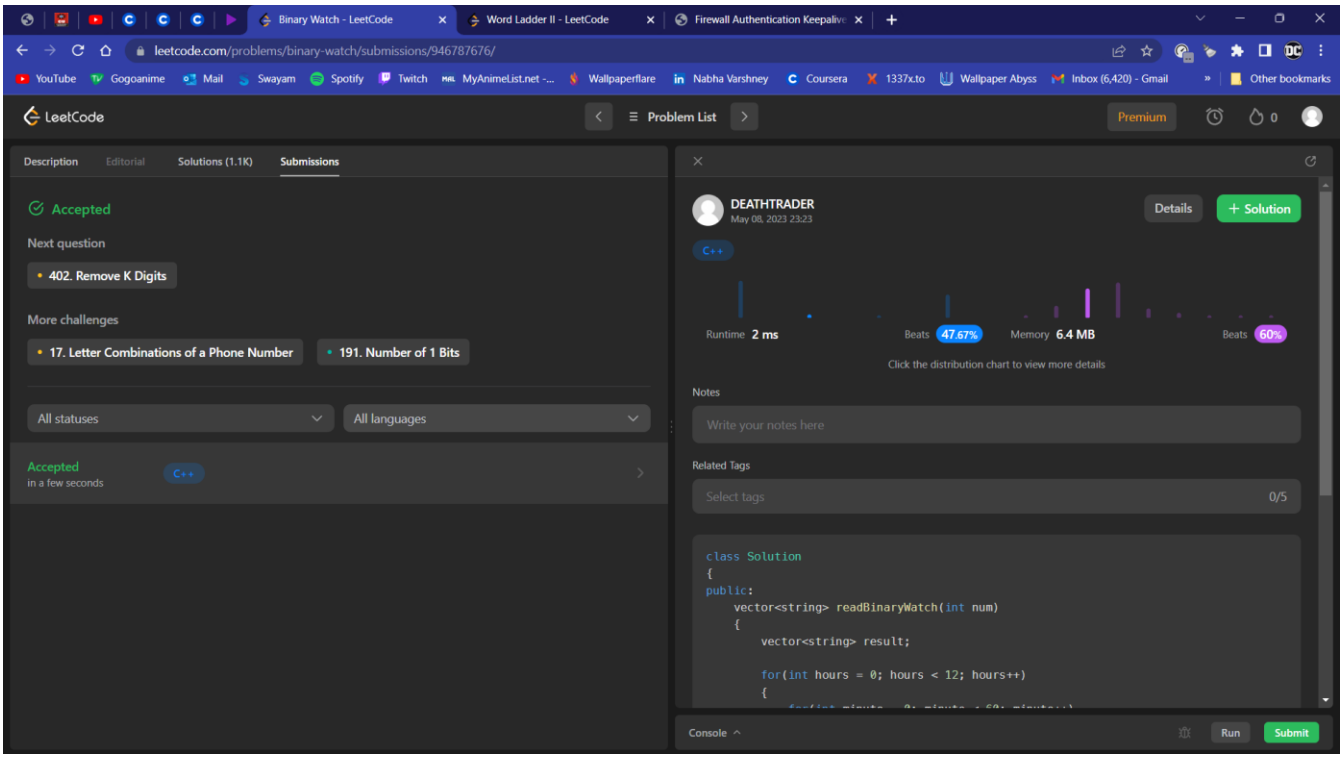
```
class Solution
{
public:
    vector<string> readBinaryWatch(int num)
    {
        vector<string> result;

        for(int hours = 0; hours < 12; hours++)
        {
            for(int minute = 0; minute < 60; minute++)
            {
                string temp = "";
                if(__builtin_popcount(hours) + __builtin_popcount(minute) == num )
```

```
                {
                    temp += to_string(hours) + ":";

                    if(minute < 10)
                    {
                        temp += "0";
                    }
                    temp += to_string(minute);
                    result.push_back(temp);
                }
            }
        }
        return result;
    }
};
```

Output -



2) Word Ladder II

https://leetcode.com/problems/word-ladder-ii/

Code -

```
class Solution
{
public:
    vector<vector<string>> res;
    vector<string> te;
    unordered_map<string, int> mp;
    string b;
    void dfs(string s)  // Step 2
    {
        te.push_back(s);
        if (s == b)
        {
            vector<string> x = te;
            reverse(x.begin(), x.end());
            res.push_back(x);
            te.pop_back();
            return;
        }
        int cur = mp[s];
        for (int i = 0; i < s.size(); i++)
        {
            char c = s[i];
            for (char cc = 'a'; cc <= 'z'; cc++)
            {
                s[i] = cc;
                if (mp.count(s) && mp[s] == cur - 1)
                    dfs(s);
            }
            s[i] = c;
        }
        te.pop_back();
        return;
    }
    vector<vector<string>> findLadders(string beginWord, string endWord,
vector<string> &wordList)
    {
        unordered_set<string> dict(wordList.begin(), wordList.end());
        b = beginWord;
        queue<string> q;
```

```
            int k = beginWord.size();
            q.push({beginWord});
            mp[beginWord] = 0;
            while (!q.empty())  // Step 1
            {
                int n = q.size();
                while (n--)
                {
                    string t = q.front();
                    q.pop();
                    int x = mp[t] + 1;
                    for (int i = 0; i < k; i++)
                    {
                        string temp = t;
                        for (char ch = 'a'; ch <= 'z'; ch++)
                        {
                            temp[i] = ch;
                            if (!mp.count(temp) && dict.count(temp))
                                mp[temp] = x, q.push(temp);
                        }
                    }
                }
            }
            if (mp.count(endWord))
                dfs(endWord);
            return res;
        }
    };
```

Output –