Lab Assignment 1

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1. Write a C program to recognise strings under ‘a*’, ‘a*b+’.

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

int main(){
    while(true){
        string a;
        int i = 0;
        cout << "\nEnter the string: ";
        cin >> a;
        if(a.size() == 0){
            cout << "\nValid String.";
        }
        else{
            int i = 0;
            if(a[i] == 'a'){
                while(a[i] == 'a' && i < a.size()){
                    i++;
                }
            }
            if(a[i] == 'b' && i <a.size()){
                while(a[i] == 'b' && i <a.size()){
                    i++;
                }
            }
            if(i >= a.size()){
                cout << "\nValid String.";
            }
            else{
                cout << "\nInvalid String.";
            }
        }
    }
    return 0;
}
```

```
~/D/C/V/S/Lab cd "/Users/garvitshah/Desktop/Colleg
llege/VI/SS/Lab/"q1

Enter the string: aa

Valid String.
Enter the string: bb

Valid String.
Enter the string:
```

2. Create a DFA program that recognises strings consisting of alternating 0s and 1s (e.g., "0101" or "1010"). Test the DFA with both valid and invalid examples. You need to output state-wise transitions. E.g., for any given string 10, starting from first state, where DFA is going on each character.

```cpp
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;

int dfa(int state, string a, int pos, int b){
    int n;
    if(state == 1){
        n = 1;
    }
    else{
        n = 2;
    }
    while(pos < a.size()){
        b = b^1;
        // cout << (int)a[pos] << '\n';
        if((int)a[pos] == b){
            state = state^n;
            cout << a[pos] << " - State " <<  state << '\n';
        }
        else{
            return 0;
        }
        pos++;
    }
    return 1;
}

int main(){
    string a;
    cout << "Enter the string of 1's and 0's: ";
    int i = 0;
    cin >> a;
    cout << "Starting at State 0 \n";
    int b=(int)a[0];
    if(b == '0'){
        cout << a[0] << " - State 1\n";
        if(dfa(1, a, 1, b)){
            cout << "Valid";
        }
        else{
            cout << "Invalid";
        }
    }
    else if(b == '1'){
        cout << a[0] << " - State 2\n";
        if(dfa(1, a, 1, b)){
            cout << "Valid";
        }
        else{
            cout << "Invalid";
        }
    }
    else{
        cout << "Invalid String.";
        return 0;
    }
    // cout << "Valid String.";
    return 0;
}
```

```
~/D/C/V/S/Lab cd "/Users/garvitshah/D
llege/VI/SS/Lab/"q2
Enter the string of 1's and 0's: 0101
Starting at State 0
0 - State 1
1 - State 0
0 - State 1
1 - State 0
Valid
```