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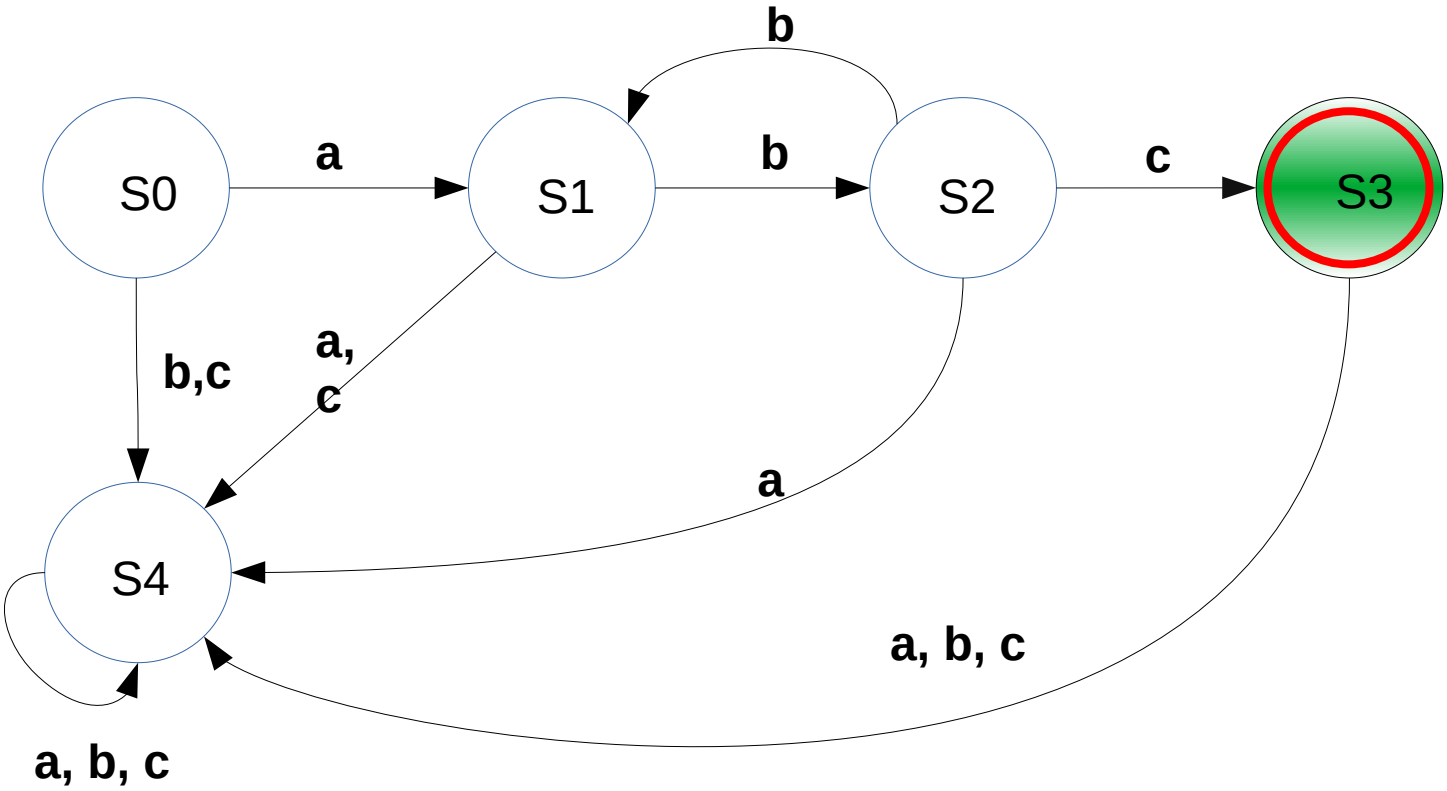
Compiler Construction Lab 1

Task 1

Regular Expression: a(bb)*bc

Part A) DFA



Part B) Language

A language that starts with ‘a’ and ends with ‘c’ and have only odd number of ‘b’s between them.

Part C) Code Implementation in C++ (i)

(ii) Goto

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

int main() {
string str;

cout << "Enter a String: ";
cin >> str;


// Validation of ALphabet
for (char c : str){
if (c != 'a' && c!= 'b' && c!='c'){
cout << "[-] Input string is invalid ( i.e. doesn't belong to {a,b,c} )\n\n";
return 0;
}
}

// GOTO implementation
int i = 0;
s0:
if (str[i] == 'a'){
i++;
}
else if(str[i] == 'b' || str[i] == 'c'){
goto s4;
}
s1:
if (str[i] == 'b'){
i++;
}
else if(str[i] == 'a' || str[i] == 'c'){
goto s4;
}

s2:
if (str[i] == 'c'){
i++;
}
else if(str[i] == 'b'){
i++;
goto s1;
}
else if(str[i] == 'a'){
goto s4;
}
```

```
s3: // State Final
if (str.length() == i){
cout << "[+]Your entered string '" << str << "' is acceptable\n\n";
return 1;
}
s4: //Garbage state
cout << "[-]Your entered string '" << str << "' is unacceptable\n\n";
return 0;
}
```

(ii) Switch Statement

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

int main() {
string str;

cout << "Enter a String: ";
cin >> str;


// Validation of ALphabet
for (char c : str){
if (c != 'a' && c!= 'b' && c!='c'){
cout << "[-] Input string is invalid ( i.e. doesn't belong to {a,b,c} )\n\n";
return 0;
}
}

// Switch implementation
int state = 0;

for (char c : str){
switch(state){
case 0:{
switch(c){
case 'a':{
state = 1;
break;
}
default:{
state = 4;
break;
}
}
break;
}
case 1:{
```

```
switch(c){
case 'b':{
state = 2;
break;
}
default:{
state = 4;
break;
}
}
break;
}
case 2:{
switch(c){
case 'c':{
state=3;
break;
}
case 'b':{
state = 1;
break;
}
default:{
state = 4;
break;
}
}
break;
}
case 3:{
switch(c){
case 'a':
case 'b':
case 'c':{
state = 4;
break;
}
}
break;
}
}
}
switch(state){
case 3:{
cout << "[+]Your entered string '" << str << "' is acceptable\n\n";
return 1;
}
default:{
cout << "[-]Your entered string '" << str << "' is unacceptable\n\n";
return 0;
}
```

```
}
}
```

Part D) Testing Implementation

(ii) Goto

```
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ gcc task1.cc -lstdc++ -o task
^[[Ascolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abc
[+]Your entered string 'abc' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbc
[-]Your entered string 'abbc' is unacceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abcd
[-] Input string is invalid ( i.e. doesn't belong to {a,b,c} )

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbbc
[+]Your entered string 'abbbc' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbbbc
[-]Your entered string 'abbbbc' is unacceptable
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$
```

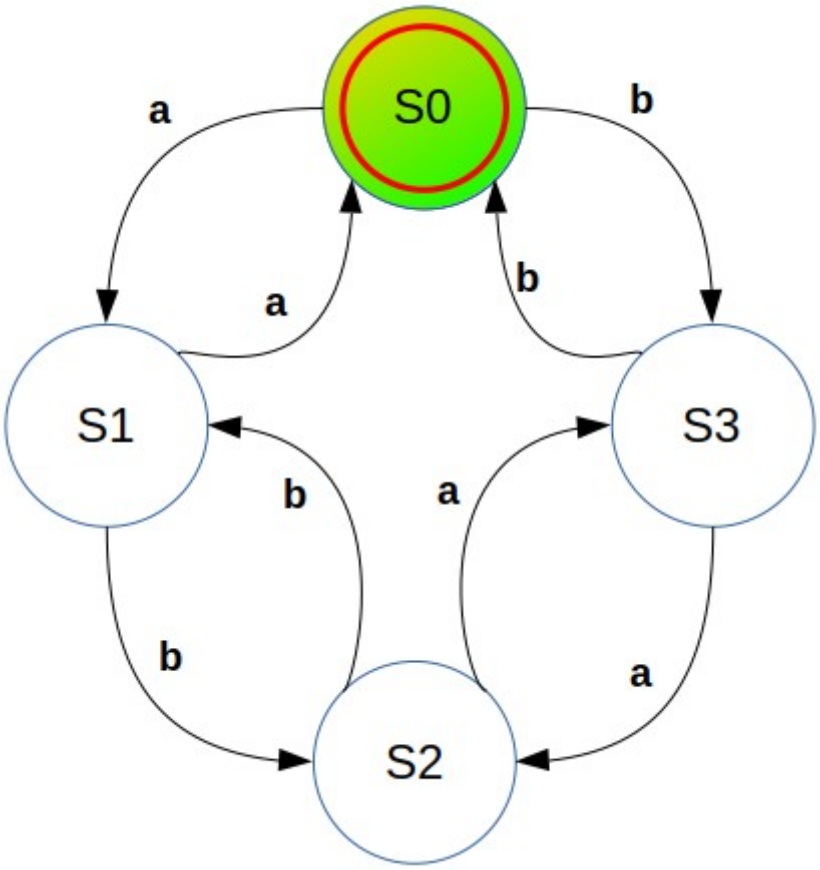
(ii) Switch

```
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ gcc task1b.cc -lstdc++ -o task
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abc
[+]Your entered string 'abc' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbc
[-]Your entered string 'abbc' is unacceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abcd
[-] Input string is invalid ( i.e. doesn't belong to {a,b,c} )

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbbc
[+]Your entered string 'abbbc' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abbbbc
[-]Your entered string 'abbbbc' is unacceptable
```

Task 2

L(M) = {w | w € {a, b}* and contains even number of a's and b's}

Part A) DFA



Part B) Code Implementation in C++ (i)

(ii) Goto

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

int main() {
string str = "";

cout << "Enter a String: ";
getline(cin,str);

// Validation of ALphabet
for (char c : str){
if (c != 'a' && c!= 'b'){
cout << "[-] Input string is invalid ( i.e. doesn't belong to {a,b} )\n\n";
return 0;
}
}

// GOTO implementation
int i = 0;
s0:
```

```
if (str[i] == 'a'){
i++;
}
else if (str[i] == 'b'){
i++;
goto s3;
}
else if (str.length() == i){
cout << "[+]Your entered string '" << str << "' is acceptable\n\n";
return 1;
}
s1:
if (str[i] == 'b'){
i++;
}
else if(str[i] =='a'){
i++;
goto s0;
}

s2:
if (str[i] == 'a'){
i++;
}
else if(str[i] == 'b'){
i++;
goto s1;
}

s3: // State Final
if (str[i] == 'a'){
i++;
goto s2;
}
else if(str[i] == 'b'){
i++;
goto s0;
}
cout << "[-]Your entered string '" << str << "' is unacceptable\n\n";
return 0;
}
```

(iii) Switch

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

int main() {
string str = "";
```

```
cout << "Enter a String: ";
getline(cin,str);

// Validation of ALphabet
for (char c : str){
if (c != 'a' && c!= 'b'){
cout << "[-] Input string is invalid ( i.e. doesn't belong to {a,b} )\n\n";
return 0;
}
}

// Switch implementation
int state = 0;

for (char c : str){
switch(state){
case 0:{
switch(c){
case 'a':{
state = 1;
break;
}
case 'b':{
state = 3;
break;
}
}
break;
}
case 1:{
switch(c){
case 'a':{
state = 0;
break;
}
case 'b':{
state = 2;
break;
}
}
break;
}
case 2:{
switch(c){
case 'a':{
state=3;
break;
}
case 'b':{
state = 1;
break;
```

```
}
}
break;
}
case 3:{
switch(c){
case 'a':{
state = 2;
break;
}
case 'b':{
state = 0;
}
}
break;
}
}
}
switch(state){
case 0:{
cout << "[+]Your entered string '" << str << "' is acceptable\n\n";
return 1;
}
default:{
cout << "[-]Your entered string '" << str << "' is unacceptable\n\n";
return 0;
}
}
}
```

Part C) Testing Implementation

(i) Goto

```
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ gcc task2.cc -lstdc++ -o task
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: aa
[+]Your entered string 'aa' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abba
[+]Your entered string 'abba' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abab
[+]Your entered string 'abab' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: aabbaabb
[+]Your entered string 'aabbaabb' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String:
[+]Your entered string '' is acceptable
```

(ii) Switch

```
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ gcc task2b.cc -lstdc++ -o task
scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: aa
[+]Your entered string 'aa' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abba
[+]Your entered string 'abba' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: abab
[+]Your entered string 'abab' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String: aabbaabb
[+]Your entered string 'aabbaabb' is acceptable

scolopendra@scolopendra-bytes:~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 1$ ./task
Enter a String:
[+]Your entered string '' is acceptable
```