

# *Ahsanullah University of Science & Technology*

Department of Computer Science & Engineering



CSE 4130

Formal Languages & Compilers Lab

Session: 05

Assignment: 05

Submitted By:

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Lab Group: A2

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## Questions:

1. Implement the following CFG, in the way shown above or with the help of a user defined stack, that is, in the way it may work in an implementation of the transition function of a PDA.

$A \rightarrow aXd$   
 $X \rightarrow bbX$   
 $X \rightarrow bcX$   
 $X \rightarrow \varepsilon$

2. Implement the CFG for generating simple arithmetic expressions.

## Solution 1:

### Source Code:

```
1.  /*
2.      AUTHOR: Syed Sanzam
3.      Topic : Context Free Grammar
4.      DATE: 23.09.19
5.
6.      The Code follows the following CFG,
7.          A --> a X d
8.          X --> b b X
9.          X --> b c X
10.         X --> Empty
11. */
12.
13.
14. #include <bits/stdc++.h>
15.
16. using namespace std;
17.
18.
19. int len;
20. int read = 0;
21.
22. bool X(string str)
23. {
24.     bool checkLastChar = true;
25.     while(read < len - 1)
26.     {
27.         if(str[read] == 'b')
28.         {
29.             if(str[read + 1] == 'b')
30.             {
31.                 read = read + 2;
32.             }
33.             else if(str[read + 1] == 'c')
34.             {
```

```

35.         read = read + 2;
36.     }
37.     else
38.     {
39.         checkLastChar = false;
40.         break;
41.     }
42. }
43.
44.     else
45.     {
46.         checkLastChar = false;
47.         break;
48.     }
49. }
50. return checkLastChar;
51. }
52.
53. void A(string str)
54. {
55.     len = str.length();
56.     if(str[0] == 'a')
57.     {
58.         read++;
59.         if(len == 2)
60.         {
61.             if(str[len - 1] == 'd')
62.             {
63.                 cout << "Accepted" << endl;
64.             }
65.             else
66.             {
67.                 cout << "Not Accepted" << endl;
68.             }
69.         }
70.         else
71.         {
72.             if(X(str))
73.             {
74.                 if(str[len - 1] == 'd')
75.                 {
76.                     cout << "Accepted" << endl;
77.                 }
78.                 else
79.                 {
80.                     cout << "Not Accepted" << endl;
81.                 }
82.             }
83.             else
84.             {
85.
86.                 cout << "Not Accepted" << endl;
87.             }
88.         }
89.     }
90. }
91.
92. void init()
93. {
94.     int noOfTimes = 0;
95.     string s = " ";

```

```

96.
97.     cout << "No. of Times :" << endl;
98.     cin >> noOfTimes;
99.
100.         for(int i = 0; i < noOfTimes; i++)
101.         {
102.             cout << "String: ";
103.             cin >> s;
104.             A(s);
105.             len = 0;
106.             read = 0;
107.             cout << endl;
108.         }
109.     }
110.
111.     int main()
112.     {
113.         init();
114.         return 0;
115.     }

```

Inputs and Outputs:

```

"C:\Users\Syed Sanzam\Desktop\Assignment #5\5a5.exe"
No. of Times :
3
String: ad
Accepted

String: abbbcbbbcd
Accepted

String: abbbcbcd
Not Accepted

Process returned 0 (0x0)   execution time : 14.587 s
Press any key to continue.

```

## Solution 2:

Source Code:

```

1.  /*
2.     AUTHOR: Syed Sanzam
3.     Topic : Context Free Grammar (Evaluation of Arithmetic Expression)
4.     DATE: 25.09.19
5.
6.     The Code follows the following CFG,
7.
8.         E -> E + T | E - T | T

```

```

9.
10.      T -> T * F | T / F | F
11.
12.      F -> (E) | n
13. */
14.
15. #include <bits/stdc++.h>
16.
17. using namespace std;
18.
19. int len;
20. int read = 0;
21. bool check;
22.
23. void factor(string s);
24.
25. bool isNumber(string s)
26. {
27.     bool isNum = false;
28.     while(true)
29.     {
30.         if(isdigit(s[read]))
31.         {
32.             read++;
33.             isNum = true;
34.         }
35.
36.         else
37.             break;
38.     }
39.
40.     return isNum;
41. }
42.
43.
44. bool isChar(string s)
45. {
46.     bool isChar = false;
47.     while(true)
48.     {
49.         if(isalpha(s[read]))
50.         {
51.             read++;
52.             isChar = true;
53.         }
54.
55.         else
56.             break;
57.     }
58.
59.     return isChar;
60. }
61.
62. void term(string s)
63. {
64.     factor(s);
65.     if(read < len)
66.     {
67.         if(check)
68.         {

```

```

69.         if(s[read] == '+' || s[read] == '-'
70.         || s[read] == '*' || s[read] == '/' || s[read] == '=')
71.         {
72.             check = true;
73.             read++;
74.             term(s);
75.         }
76.         else
77.         {
78.             check = false;
79.             return;
80.         }
81.     }
82.     else
83.         return;
84. }
85.
86. void factor(string s)
87. {
88.     check = false;
89.     if(read < len)
90.     {
91.         if(isNumber(s) || isChar(s))
92.         {
93.             check = true;
94.             return;
95.         }
96.         else if(s[read] == '(')
97.         {
98.             read++;
99.             term(s);
100.            if(s[read] == ')')
101.            {
102.                read++;
103.                check = true;
104.                return;
105.            }
106.            else
107.                check = false;
108.        }
109.
110.        else
111.        {
112.            read++;
113.            check = false;
114.            return ;
115.        }
116.    }
117.    else
118.        return;
119. }
120.
121. void expression(string s)
122. {
123.     if(s.length() > 1)
124.     {
125.         term(s);
126.         if(check)
127.             cout << "Accepted!" << endl;
128.     }

```

```

129.         else
130.             cout << "Not Accepted!" << endl;
131.     }
132.     else
133.         cout << "Accepted!" << endl;
134. }
135.
136. void init()
137. {
138.     int noOfTime = 0;
139.     cout << "No. of Times: " << endl;
140.     cin >> noOfTime;
141.     for(int i = 0; i < noOfTime; i++)
142.     {
143.         string s;
144.         cout << "Expression: " << endl;
145.         cin >> s;
146.         len = s.length();
147.         expression(s);
148.
149.         read = 0;
150.     }
151. }
152.
153. int main()
154. {
155.     init();
156.     return 0;
157. }

```

Inputs and Outputs:



```

C:\Users\Syed Sanzam\Desktop\Assignment #5\a5_2.exe
No. of Times:
3
Expression:
a
Accepted!
Expression:
((a+b)/c)
Accepted!
Expression:
a++b)
Not Accepted!

Process returned 0 (0x0)   execution time : 20.937 s
Press any key to continue.

```