Week 7: Implementation of LL(1) parser using C

Week 7 Programs

1. Implement non-recursive Predictive Parser for the grammar

S -> aBa
B -> bB | ε

	a	b	$
S	S→aBa		
B	B→ε	B→bB	

Program:

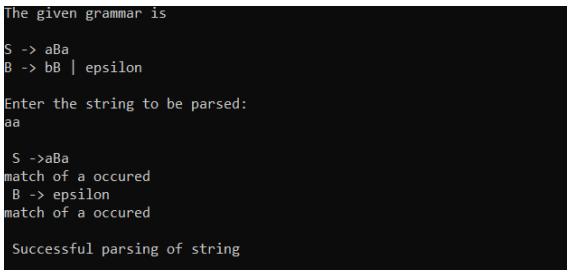
```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<string.h>
int i=0,top=0;
char stack[20],ip[20];

void push(char c)
{
if (top>=20)
printf("Stack Overflow");
else
stack[top++]=c;
}
void pop(void)
{
if(top<0)
printf("Stack underflow");
else
top--;
}

void error(void)
{
printf("\n\nSyntax Error!!!! String is invalid\n"); exit(0);
}

int main()
{
int n;

printf("The given grammar is\n\n");
printf("S -> aBa\n");
```

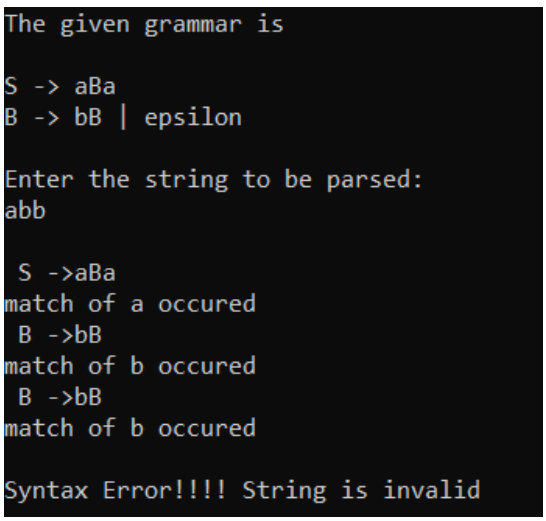
```
printf("B -> bB | epsilon \n\n");
printf("Enter the string to be parsed:\n");
                scanf("%s",ip);
n=strlen(ip);
ip[n]='$';
ip[n+1]='\0';
push('$');
push('S');
while(ip[i]!='\0')
{ if(ip[i]=='$' && stack[top-1]=='$')
 {
printf("\n\n Successful parsing of string \n"); return 1;
 }
 else
if(ip[i]==stack[top-1])
{
 printf("\nmatch of %c ",ip[i]);
 i++;pop();
}
else
{
if(stack[top-1]=='S' && ip[i]=='a')
{
 printf(" \n S ->aBa");
 pop();
 push('a');
 push('B');
 push('a');
}
else
if(stack[top-1]=='B' && ip[i]=='b')
{
printf("\n B ->bB");
pop();push('B');push('b');
}
 else
 if(stack[top-1]=='B' && ip[i]=='a')
 {
printf("\n B -> epsilon");
pop();
 }
 else
 error();
}
}
}//end of main

}
```

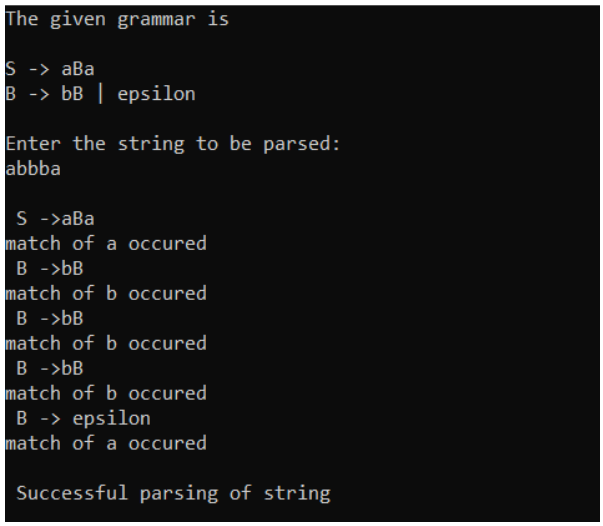
Testcases:

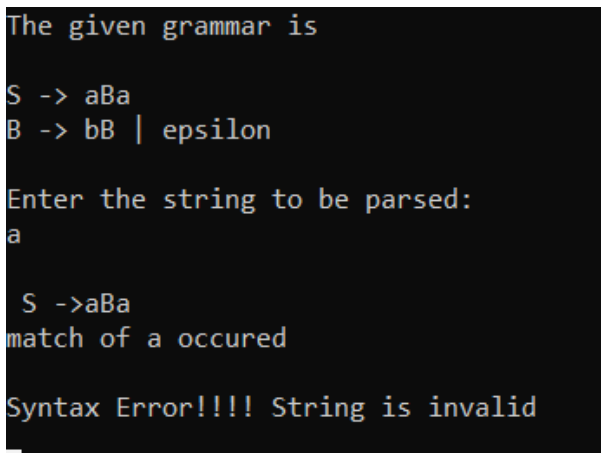
aa	Successful parsing of string
abbba	Successful parsing of string
abbb	Error in parsing String
a	Error in parsing String

Output:









2. **Lab Assignment:** Implement Predictive Parser using C for the Expression Grammar

E → TE’
E’→ +TE’ | ε
T → FT’
T’→ *FT’ | ε
F → (E) | d

	d	+	*	(	)	$
E	E→TA			E→TA		
A		A→+TA			A→ε	A→ε
T	T→FB			T→FB		
B		B→ε	B→*FB		B→ε	B→ε
F	F→d			F→(E)		

Program:

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<string.h>
int i=0,top=0;
char stack[20],ip[20];
void push(char c)
{
   if (top>=20)
      printf("Stack Overflow");
   else
      stack[top++]=c;
}
void pop(void)
{
```

```
    if(top<0)
        printf("Stack underflow");
    else
        top--;
}
void error(void)
{
    printf("\n\nSyntax Error!!!! String is invalid\n");
    exit(0);
}
int main()
{
    int n;
    printf("The given grammar is\n\n");
    printf("E -> TE'\n");
    printf("E'-> +TE' | epsilon \n");
    printf("T ->FT' \n");
    printf("T'->*FT' | epsilon \n");
    printf("F ->(E) | d \n\n");
    printf("Enter the string to be parsed:\n");
    scanf("%s",ip);
    n=strlen(ip);
    ip[n]='$';
    ip[n+1]='\0';
    push('$');
    push('E');
    while(ip[i]!='\0')
    {
        if(ip[i]=='$' && stack[top-1]=='$')
        {
            printf("\n\n Successful parsing of string \n");
            return 1;
        }
```

```
else if(ip[i]==stack[top-1])
{
   printf("\nmatch of %c ",ip[i]);
   i++;pop();
}
else
{
   if(stack[top-1]=='E' && (ip[i]=='d' || ip[i]=='('))
   {
      printf(" \n E -> TE'");
      pop();
      push('A');//E'
      push('T');
   }
   else if(stack[top-1]=='A' && ip[i]=='+') //E'
   {
      printf("\n E' ->+TE'");
      pop();push('A');push('T');push('+');
   }
   else if(stack[top-1]=='A' && (ip[i]==')' || ip[i]=='$'))
   {
      printf("\n E' -> epsilon");
      pop();
   }
   else if(stack[top-1]=='T' && (ip[i]=='d' || ip[i]=='('))
   {
      printf("\n T ->FT'");
      pop();push('B');push('F'); //B is T'
   }
   else if(stack[top-1]=='B' && ip[i]=='*')
   {
      printf("\n T' ->*FT'");
      pop();push('B');push('F');push('*');
```

```
        }
        else if(stack[top-1]=='B' && (ip[i]=='+' || ip[i]==')'|| ip[i]=='$'))
        {
            printf("\n T' ->epsilon");
            pop();
        }
        else if(stack[top-1]=='F' && ip[i]=='d')
        {
            printf("\n F ->d");
            pop();push('d');
        }
        else if(stack[top-1]=='F' && ip[i]=='(')
        {
            printf("\n F ->(E)");
            pop();push(')');push('E');push('(');
        }
        else
            error();
      }
   }
}
```

Testcases:

d+d	Successful parsing of string
d*d	Successful parsing of string
(d+d)*d	Successful parsing of string
d+*+d	Error in parsing String
i+i	Error in parsing String

Output:

```
The given grammar is

E -> TE'
E'-> +TE' | epsilon
T ->FT'
T'->*FT' | epsilon
F ->(E) | d

Enter the string to be parsed:
d+d

 E -> TE'
 T ->FT'
 F ->d
match of d
 T' ->epsilon
 E' ->+TE'
match of +
 T ->FT'
 F ->d
match of d
 T' ->epsilon
 E' -> epsilon

 Successful parsing of string
```

```
The given grammar is

E -> TE'
E'-> +TE' | epsilon
T ->FT'
T'->*FT' | epsilon
F ->(E) | d

Enter the string to be parsed:
d*d

 E -> TE'
 T ->FT'
 F ->d
match of d
 T' ->*FT'
match of *
 F ->d
match of d
 T' ->epsilon
 E' -> epsilon

 Successful parsing of string
```

```
The given grammar is

E -> TE'
E'-> +TE' | epsilon
T ->FT'
T'->*FT' | epsilon
F ->(E) | d

Enter the string to be parsed:
(d+d)*d

 E -> TE'
 T ->FT'
 F ->(E)
match of (
 E -> TE'
 T ->FT'
 F ->d
match of d
 T' ->epsilon
 E' ->+TE'
match of +
 T ->FT'
 F ->d
match of d
 T' ->epsilon
 E' -> epsilon
match of )
 T' ->*FT'
match of *
 F ->d
match of d
 T' ->epsilon
 E' -> epsilon

 Successful parsing of string
```

```
The given grammar is

E -> TE'
E'-> +TE' | epsilon
T ->FT'
T'->*FT' | epsilon
F ->(E) | d

Enter the string to be parsed:
d+*+d

 E -> TE'
 T ->FT'
 F ->d
match of d
 T' ->epsilon
 E' ->+TE'
match of +

Syntax Error!!!! String is invalid
```

```
The given grammar is

E -> TE'
E'-> +TE' | epsilon
T ->FT'
T'->*FT' | epsilon
F ->(E) | d

Enter the string to be parsed:
i+i


Syntax Error!!!! String is invalid
```