Solution for Assignment 5

1. Consider the following context-free grammar

   A → B C D | f B

   B → a B | ε

   C → b C f | c | ε

   D → d D | e | ε

   where A is the start symbol.

(a) (30%) Compute First sets and Follow sets for the nonterminals in the grammar.

Ans :

First(A) = {a,b,c,d,e,f,ε}	Follow(A) = {$}
First(B) = {a,ε}	Follow(B) = {b,c,d,e,$}
First(C) = {b,c,ε}	Follow(C) = {d,e,f,$}
First(D) = {d,e,ε}	Follow(D) = {$}

(b) (40%) Construct the functions of the recursive-decent parser for the nonterminals.

Ans:

```
const int
    a = 1;b = 2;c = 3;d = 4;e = 5;f = 6; $ = 7;
int token = lexer();
void match(int t){
    if(token == t) token = lexer(); else error();
}
void A(){
    switch(token){
        case a :
        case b :
        case c :
        case d :
        case e :
        case $ :
            B(); C(); D(); break;
        case f :
            match(f); B(); break;
        default : error();
    }
}
```

```
void B(){
    switch(token){
        case a :
            match(a); B(); break;
        case b :
        case c :
        case d :
        case e :
        case $ :
            break;
        default : error();
    }
}
void C(){
    switch(token){
        case b :
            match(b); C(); match(f); break;
        case c :
            match(c); break;
        case d :
        case e :
        case f :
        case $ :
            break;
        default : error();
    }
}
void D(){
    switch(token){
        case d :
            match(d); D(); break;
        case e :
            match(e) ; break;
        case $ :
            break;
        default : error();
    }
}
```

(c) (30%) Construct the parsing table of the table-driven predictive parser for the grammar.

Ans:

	A	B	C	D
a	A → B C D	B → a B		
b	A → B C D	B → ε	C → b C f	
c	A → B C D	B → ε	C → c	
d	A → B C D	B → ε	C → ε	D → d D
e	A → B C D	B → ε	C → ε	D → e
f	A → f B		C → ε	
$	A → B C D	B → ε	C → ε	D → ε