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CD LAB 9

```
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
#include "lex_analyzer.h"

void program();
void declarations();
void datatype();
void idlist();
void idlistprime();
void assignstat();
void statement_list();
void statement();
void expn();
void eprime();
void simpleexp();
void seprime();
void term();
void tprime();
void factor();
void decision_stat();
void dprime();
void looping_stat();
void relop();
void addop();
void mulop();
void printerror(struct token*);

void printerror(struct token* tkn)
{
	printf("error at row: %d, col: %d for lexeme \" %s \" \n", tkn->row, tkn->col,
tkn->lexeme);
	printf("----------------ERROR!----------------\n");
	exit(0);
}


// all declarations
struct token tkn;
```

```
FILE *f1;
char *rel[]={"==","!=","<=",">=",">","<"};
char *add[]={"+","-"};
char *mul[]={"*","/","%"};

//check for comparison operators
int isrel(char *w)
{
	int i;
	for(i=0;i<sizeof(rel)/sizeof(char*);i++)
	{
		if(strcmp(w,rel[i])==0)
		{
			return 1;
		}
	}
	return 0;
}

//check for +, - operators
int isadd(char *w)
{
	int i;
	for(i=0;i<sizeof(add)/sizeof(char*);i++)
	{
		if(strcmp(w,add[i])==0)
		{
			return 1;
		}
	}
	return 0;
}

//check for *, /, % operators
int ismul(char *w)
{
	int i;
	for(i=0;i<sizeof(mul)/sizeof(char*);i++)
	{
		if(strcmp(w,mul[i])==0)
		{
			return 1;
		}
	}
	return 0;
}

void program()
{

	if(strcmp(tkn.lexeme,"main")==0)
	{
```

```
		tkn=getNextToken(f1);
		if(strcmp(tkn.lexeme,"(")==0)
		{
			tkn=getNextToken(f1);
			if(strcmp(tkn.lexeme,")")==0)
			{
				tkn=getNextToken(f1);
				if(strcmp(tkn.lexeme,"{")==0)
				{
					tkn=getNextToken(f1);
					declarations();
					statement_list();
					if(strcmp(tkn.lexeme,"}")==0)
					{
						return;
					}
					else if(strcmp(tkn.lexeme,"for")==0 ||
strcmp("while",tkn.lexeme)==0)	// loop beginning
					{
						looping_stat();
						if(strcmp(tkn.lexeme,"}")==0)
						{
						return;
						exit(0);
						}
						else if(strcmp(tkn.lexeme,"for")==0 ||
strcmp("while",tkn.lexeme)==0)
						{
						looping_stat();
						}
						else if(strcmp(tkn.lexeme,"if")==0)
						{
						decision_stat();
						}
						else
						{
						printf("} missing at row=%d
col=%d",tkn.row,tkn.col);
						exit(1);
						}
					}
					else if(strcmp(tkn.lexeme,"if")==0) // conditional
statement beginning
					{
						decision_stat();
						if(strcmp(tkn.lexeme,"}")==0)
						{
						return;
						}
						else if(strcmp(tkn.lexeme,"for")==0 ||
strcmp("while",tkn.lexeme)==0)
						{
```

```
                                        looping_stat();
                                        }
                                        else if(strcmp(tkn.lexeme,"if")==0)
                                        {
                                        decision_stat();
                                        }
                                        else
                                        {
                                        printerror(&tkn);
                                        }
                                }
                                else
                                {
                                        printerror(&tkn);
                                }
                        }
                        else
                        {
                                printf("{ missing at row=%d col=%d",tkn.row,tkn.col);
                                exit(1);
                        }
                }
                else
                {
                        printf(") missing at row=%d col=%d",tkn.row,tkn.col);
                        exit(1);
                }
        }
        else
        {
                printf("( missing at row=%d col=%d",tkn.row,tkn.col);
                exit(1);
        }
    }
}


void declarations()
{
    if(isdtype(tkn.lexeme)==0)
    {
        return;
    }
    datatype();
    idlist();
    if(strcmp(tkn.lexeme,";")==0)
    {
        tkn=getNextToken(f1);
        declarations();
    }
    else
    {
```

```
                printerror(&tkn);
        }
}

//check for the correct datatype
void datatype()
{
        if(strcmp(tkn.lexeme,"int")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        else if(strcmp(tkn.lexeme,"char")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        else
        {
                printerror(&tkn);
        }
}

void idlist()
{
        if(strcmp(tkn.type,"identifier")==0)
        {
                tkn=getNextToken(f1);
                idlistprime();
        }
        else
        {
                printerror(&tkn);
        }
}
void idlistprime()
{
        if(strcmp(tkn.lexeme,",")==0)
        {
                tkn=getNextToken(f1);
                idlist();
        }
        if(strcmp(tkn.lexeme,"[")==0)
        {
                tkn=getNextToken(f1);
                if(strcmp(tkn.type,"number")==0)
                {
                        tkn=getNextToken(f1);
                        if(strcmp(tkn.lexeme,"]")==0)
                        {
                                tkn=getNextToken(f1);
                                if(strcmp(tkn.lexeme,",")==0)
```

```
                        {
                                tkn=getNextToken(f1);
                                idlist();
                        }
                        else
                        {
                                return;
                        }
                }
                else
                {
                        printerror(&tkn);
                }
        }
    }
    else
    {
        return;
    }
}
void statement_list()
{
    if(strcmp(tkn.type,"identifier")!=0)
    {
        return;
    }
    statement();
    statement_list();
}
void statement()
{
    if(strcmp(tkn.type,"identifier")==0)
    {
        assignstat();
        if(strcmp(tkn.lexeme,";")==0)
        {
            tkn=getNextToken(f1);
            return;
        }
        else
        {
            printerror(&tkn);
        }
    }
    if(strcmp(tkn.lexeme,"if")==0)
    {
        decision_stat();
    }
    if(strcmp(tkn.lexeme,"while")==0 || strcmp(tkn.lexeme,"for")==0)
    {
        looping_stat();
    }
```

```
}
void assignstat()
{
	if(strcmp(tkn.type,"identifier")==0)
	{
		tkn=getNextToken(f1);
		if(strcmp(tkn.lexeme,"=")==0)
		{
			tkn=getNextToken(f1);
			expn();
		}
		else
		{
			printerror(&tkn);
		}
	}
	else
	{
		printerror(&tkn);
	}
}
void expn()
{
	simpleexp();
	eprime();
}
void eprime()
{
	if(isrel(tkn.lexeme)==0)
	{
		return;
	}
	relop();
	simpleexp();
}
void simpleexp()
{
	term();
	seprime();
}
void seprime()
{
	if(isadd(tkn.lexeme)==0)
	{
		return;
	}
	addop();
	term();
	seprime();
}
void term()
{
```

```
        factor();
        tprime();
}
void tprime()
{
        if(ismul(tkn.lexeme)==0)
        {
                return;
        }
        mulop();
        factor();
        tprime();
}
void factor()
{
        if(strcmp(tkn.type,"identifier")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        else if(strcmp(tkn.type,"number")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
}
void decision_stat()
{
        if(strcmp(tkn.lexeme,"if")==0)
        {
                tkn=getNextToken(f1);
                if(strcmp(tkn.lexeme,"(")==0)
                {
                        tkn=getNextToken(f1);
                        expn();
                        if(strcmp(tkn.lexeme,")")==0)
                        {
                                tkn=getNextToken(f1);
                                if(strcmp(tkn.lexeme,"{")==0)
                                {
                                        tkn=getNextToken(f1);
                                        statement_list();
                                        if(strcmp(tkn.lexeme,"}")==0)
                                        {
                                                tkn=getNextToken(f1);
                                                dprime();
                                        }
                                        else
                                        {
                                                printerror(&tkn);
                                        }
                                }
```

```
                        else
                        {
                                printerror(&tkn);
                        }
                }
                else
                {
                        printerror(&tkn);
                }
        }
        else
        {
                printerror(&tkn);
        }
}
}
void dprime()
{
        if(strcmp(tkn.lexeme,"else")==0)
        {
                tkn=getNextToken(f1);
                if(strcmp(tkn.lexeme,"{")==0)
                {
                        tkn=getNextToken(f1);
                        statement_list();
                        if(strcmp(tkn.lexeme,"}")==0)
                        {
                                tkn=getNextToken(f1);
                                return;
                        }
                        else
                        {
                                printerror(&tkn);
                        }
                }
                else
                {
                        printerror(&tkn);
                }
        }
        else
        {
                return;
        }
}
void looping_stat()
{
        if(strcmp(tkn.lexeme,"while")==0)
        {
                tkn=getNextToken(f1);
                if(strcmp(tkn.lexeme,"(")==0)
                {
```

```
                tkn=getNextToken(f1);
                expn();
                if(strcmp(tkn.lexeme,")")==0)
                {
                        tkn=getNextToken(f1);
                        if(strcmp(tkn.lexeme,"{")==0)
                        {
                                tkn=getNextToken(f1);
                                statement_list();
                                if(strcmp(tkn.lexeme,"}")==0)
                                {
                                        tkn=getNextToken(f1);
                                        return;
                                }
                                else
                                {
                                        printerror(&tkn);
                                }
                        }
                        else
                        {
                                printerror(&tkn);
                        }
                }
                else
                {
                        printerror(&tkn);
                }
        }
        else
        {
                printerror(&tkn);
        }
}
else if(strcmp(tkn.lexeme,"for")==0)
{
        tkn=getNextToken(f1);
        if(strcmp(tkn.lexeme,"(")==0)
        {
                tkn=getNextToken(f1);
                assignstat();
                if(strcmp(tkn.lexeme,";")==0)
                {
                        tkn=getNextToken(f1);
                        expn();
                        if(strcmp(tkn.lexeme,";")==0)
                        {
                                tkn=getNextToken(f1);
                                assignstat();
                                if(strcmp(tkn.lexeme,")")==0)
                                {
                                        tkn=getNextToken(f1);
```

```
                                        if(strcmp(tkn.lexeme,"{")==0)
                                        {
                                                tkn=getNextToken(f1);
                                                statement_list();
                                                if(strcmp(tkn.lexeme,"}")==0)
                                                {
                                                        tkn=getNextToken(f1);
                                                        return;
                                                }
                                                else
                                                {
                                                        printerror(&tkn);
                                                }
                                        }
                                        else
                                        {
                                                printerror(&tkn);
                                        }
                                }
                                else
                                {
                                        printerror(&tkn);
                                }
                        }
                        else
                        {
                                printerror(&tkn);
                        }
                }
                else
                {
                        printerror(&tkn);
                }
        }
}
void relop()
{
        if(strcmp(tkn.lexeme,"==")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,"!=")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
```

```
        if(strcmp(tkn.lexeme,"<=")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,">=")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,"<")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,">")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
}
void addop()
{
        if(strcmp(tkn.lexeme,"+")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,"-")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
}
void mulop()
{
        if(strcmp(tkn.lexeme,"*")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,"/")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
        if(strcmp(tkn.lexeme,"*")==0)
        {
                tkn=getNextToken(f1);
                return;
        }
}
```

```
int main()
{
        FILE *fa, *fb;
    int ca, cb;
    fa = fopen("inp.c", "r");
    if (fa == NULL){
        printf("Cannot open file \n");
        exit(0);
    }

    fb = fopen("out.c", "w+");
    ca = getc(fa);
        while (ca != EOF){
                if(ca==' ')
                {
                        putc(ca,fb);
                        while(ca==' ')
                                ca = getc(fa);
                }
                if (ca=='/')
                {
                        cb = getc(fa);
                        if (cb == '/')
                        {
                                while(ca != '\n')
                                        ca = getc(fa);
                        }
                        else if (cb == '*')
                        {
                                do
                                {
                                        while(ca != '*')
                                                ca = getc(fa);
                                        ca = getc(fa);
                                } while (ca != '/');
                        }
                        else{
                                putc(ca,fb);
                                putc(cb,fb);
                        }
                }
                else putc(ca,fb);
                ca = getc(fa);
        }
        fclose(fa);
        fclose(fb);
        fa = fopen("out.c", "r");
        if(fa == NULL){
                printf("Cannot open file");
                return 0;
        }
```

```
        fb = fopen("temp.c", "w+");
        ca = getc(fa);
        while (ca != EOF)
{
    if(ca==[illegible])
    {
        putc(ca,fb);
        ca=getc(fa);
        while(ca!=[illegible])
        {
            putc(ca,fb);
            ca=getc(fa);
        }
    }
    else if(ca=='#')
    {

        while(ca!='\n')
        {

            ca=getc(fa);

        }
        ca=getc(fa);
    }
putc(ca,fb);
ca = getc(fa);
}
        fclose(fa);
        fclose(fb);

        fa = fopen("temp.c", "r");
        fb = fopen("out.c", "w");
        ca = getc(fa);
        while(ca != EOF){
                putc(ca, fb);
                ca = getc(fa);
        }
        fclose(fa);
        fclose(fb);
        remove("temp.c");
        f1=fopen("out.c","r");
        if(f1==NULL)
        {
                printf("Error! File cannot be opened!\n");
                return 0;
        }

        while((tkn=getNextToken(f1)).row!=-1)
        {
                if(strcmp(tkn.lexeme,"main")==0)
                {
```

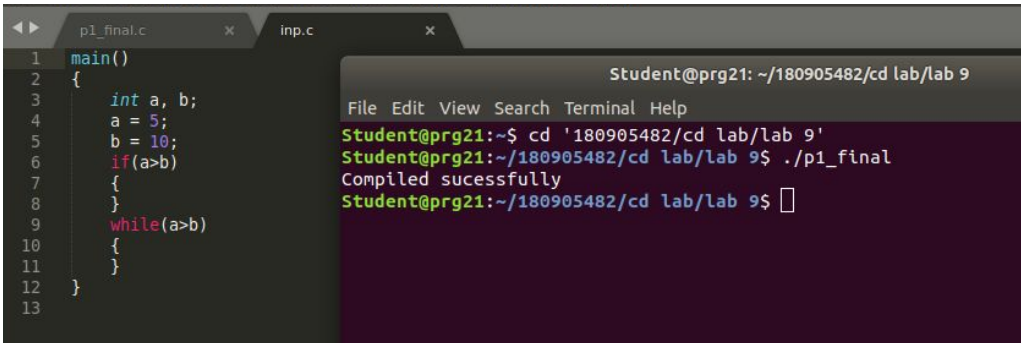
```
                        program();
                        break;
                }
        }

                printf("Compiled sucessfully\n");
    fclose(f1);
}
```

OUTPUT:-

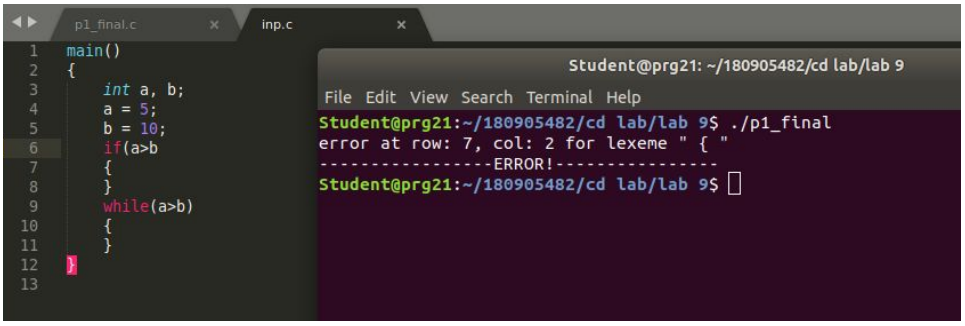
Case 1:-

```
main()
{
        int a, b;
        a = 5;
        b = 10;
        if(a>b)
        {
        }
        while(a>b)
        {
        }
}
```



Case 2:-

```
main()
{
        int a, b;
        a = 5;
        b = 10;
        if(a>b
        {
        }
        while(a>b)
        {
        }
}
```



Case 3:-

```
main()
{
        int a, b;
        a = 5;
        b = 10;
        if(a>b)
        {
        }
        while(a b)
        {
        }
}
```