LAB 8

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Batch 5

//Header file

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

const char *keywords[] = {
"auto","double","int","struct","break","else","long","switch","case","enum",
   "register","typedef","char","extern","return","union","continue","for","signed",
   "void","do","if","static","while","default","goto","sizeof","volatile","const","float",
   "short","unsigned","printf","scanf","true","false","bool"
};
const char *datypes[]={"int","char","void","float","bool","double"};
int isdtype(char *w)
{
        int i;
        for(i=0;i<sizeof(datypes)/sizeof(char*);i++)
        {
                if(strcmp(w,datypes[i])==0)
                {
                        return 1;
                }
        }
        return 0;
}
int isKeyword(char *w)
{

   int i;

   for(i=0;i<sizeof(keywords)/sizeof(char*);i++)

   {

      if(strcmp(w,keywords[i])==0)

      {

         return 1;
```

```
        }

    }

    return 0;
}
struct token
{
        char lexeme[128];
        unsigned int row,col;
        char type[64];
};
struct sttable
{
        int sno;
        char lexeme[128];
        char dtype[64];
        char type[64];
        int size;
};
int findTable(struct sttable *tab,char *nam,int n)
{
        int i=0;
        for(i=0;i<n;i++)
        {
                if(strcmp(tab[i].lexeme,nam)==0)
                {
                        return 1;
                }
        }
        return 0;
}
struct sttable fillTable(int sno,char *lexn,char *dt,char *t,int s)
{
        struct sttable tab;
        tab.sno=sno;
        strcpy(tab.lexeme,lexn);
        strcpy(tab.dtype,dt);
        strcpy(tab.type,t);
        tab.size=s;
        return tab;
}
void printTable(struct sttable *tab,int n)
{
        for(int i=0;i<n;i++)
        {
                printf("%d %s %s %s %d\
n",tab[i].sno,tab[i].lexeme,tab[i].dtype,tab[i].type,tab[i].size);
        }
}
static int row=1,col=1;
```

```
char buf[2048];
char dbuf[128];
int ind=0;
const char specialsymbols[]={'?',';',':',','};
const char arithmeticsymbols[]={'*'};
int charIs(int c,const char *arr)
{
	int len;
	if(arr==specialsymbols)
	{
		len=sizeof(specialsymbols)/sizeof(char);
	}
	else if(arr==arithmeticsymbols)
	{
		len=sizeof(arithmeticsymbols)/sizeof(char);
	}
	for(int i=0;i<len;i++)
	{
		if(c==arr[i])
		{
			return 1;
	    }
	}
	return 0;
}
void fillToken(struct token *tkn,char c,int row,int col, char *type)
{
	tkn->row=row;
	tkn->col=col;
	strcpy(tkn->type,type);
	tkn->lexeme[0]=c;
	tkn->lexeme[1]='\0';
}
void newLine()
{
	++row;
	col=1;
}
int sz(char *w)
{
	if(strcmp(w,"int")==0)
		return 4;
	if(strcmp(w,"char")==0)
		return 1;
	if(strcmp(w,"void")==0)
		return 0;
	if(strcmp(w,"float")==0)
		return 8;
	if(strcmp(w,"bool")==0)
		return 1;
}
struct token getNextToken(FILE *fa)
```

```
{
	int c;
	struct token tkn=
	{
		.row=-1
	};
	int gotToken=0;
	while(!gotToken && (c=fgetc(fa))!=EOF)
	{
		if(charIs(c,specialsymbols))
		{
			fillToken(&tkn,c,row,col,"SS");
			gotToken=1;
			++col;
		}
		else if(charIs(c,arithmeticsymbols))
		{
			fseek(fa,-1,SEEK_CUR);
			c=getc(fa);
			if(isalnum(c)){
			fillToken(&tkn,c,row,col,"ARITHMETICOPERATOR");
			gotToken=1;
			++col;
			}
			fseek(fa,1,SEEK_CUR);
		}
		else if(c=='(')
		{
			fillToken(&tkn,c,row,col,"LB");
			gotToken=1;
			col++;
		}
		else if(c==')')
		{
			fillToken(&tkn,c,row,col,"RB");
			gotToken=1;
			col++;
		}
		else if(c=='{')
		{
			fillToken(&tkn,c,row,col,"LC");
			gotToken=1;
			col++;
		}
		else if(c=='}')
		{
			fillToken(&tkn,c,row,col,"RC");
			gotToken=1;
			col++;
		}
		else if(c=='[')
		{
```

```
		fillToken(&tkn,c,row,col,"LS");
		gotToken=1;
		col++;
	}
	else if(c==']')
	{
		fillToken(&tkn,c,row,col,"RS");
		gotToken=1;
		col++;
	}
	else if(c=='+')
	{
		int x=fgetc(fa);
		if(x!='+')
		{
			fillToken(&tkn,c,row,col,"ARITHMETICOPERATOR");
			gotToken=1;
			col++;
			fseek(fa,-1,SEEK_CUR);
		}
		else
		{
			fillToken(&tkn,c,row,col,"UNARYOPERATOR");
			strcpy(tkn.lexeme,"++");
			gotToken=1;
			col+=2;
		}
	}
	else if(c=='-')
	{
		int x=fgetc(fa);
		if(x!='-')
		{
			fillToken(&tkn,c,row,col,"ARITHMETICOPERATOR");
			gotToken=1;
			col++;
			fseek(fa,-1,SEEK_CUR);
		}
		else
		{
			fillToken(&tkn,c,row,col,"UNARYOPERATOR");
			strcpy(tkn.lexeme,"++");
			gotToken=1;
			col+=2;
		}
	}
	else if(c=='=')
	{
		int x=fgetc(fa);
		if(x!='=')
		{
			fillToken(&tkn,c,row,col,"ASSIGNMENTOPERATOR");
```

```
                gotToken=1;
                col++;
                fseek(fa,-1,SEEK_CUR);
            }
            else
            {
                fillToken(&tkn,c,row,col,"RELATIONALOPERATOR");
                strcpy(tkn.lexeme,"++");
                gotToken=1;
                col+=2;
            }
        }
        else if(isdigit(c))
        {
            fillToken(&tkn,c,row,col++,"NUMBER");
            int j=1;
            while((c=fgetc(fa))!=EOF && isdigit(c))
            {
                tkn.lexeme[j++]=c;
                col++;
            }
            tkn.lexeme[j]='\0';
            gotToken=1;
            fseek(fa,-1,SEEK_CUR);
        }
        else if(c == '#')
        {
            while((c = fgetc(fa))!= EOF && c != '\n');
            newLine();
    }
    else if(c=='\n')
        {
            newLine();
            c = fgetc(fa);
            if(c == '#')
            {
                while((c = fgetc(fa)) != EOF && c != '\n');
                newLine();
            }
            else if(c != EOF)
            {
                fseek(fa, -1, SEEK_CUR);
            }
        }
        else if(isspace(c))
        {
            ++col;
        }
        else if(isalpha(c) || c=='_')
        {
            tkn.row=row;
            tkn.col=col++;
```

```
		tkn.lexeme[0]=c;
		int j=1;
		while((c=fgetc(fa))!=EOF && isalnum(c))
		{
			tkn.lexeme[j++]=c;
			col++;
		}
		tkn.lexeme[j]='\0';
		if(isKeyword(tkn.lexeme))
		{
			strcpy(tkn.type,"KEYWORD");
		}
		else
		{
			strcpy(tkn.type,"IDENTIFIER");
		}
		gotToken=1;
		fseek(fa,-1,SEEK_CUR);
	}
	else if(c=='/')
	{
		int d=fgetc(fa);
		++col;
		if(d=='/')
		{
			while((c=fgetc(fa))!= EOF && c!='\n')
			{
				++col;
			}
			if(c=='\n')
			{
			   newLine();
			}
		}
		else if(d=='*')
		{
			do
			{
				if(d=='\n')
				{
					newLine();
				}
				while((c==fgetc(fa))!= EOF && c!='*')
				{
					++col;
					if(c=='\n')
					{
						newLine();
					}
				}
				++col;
			}while((d==fgetc(fa))!= EOF && d!='/' && (++col));
```

```
                ++col;
        }
        else
        {
                fillToken(&tkn,c,row,--col,"ARITHMETIC OPERATOR");
                gotToken=1;
                fseek(fa,-1,SEEK_CUR);
        }
}
else if(c=='"')
{
        tkn.row=row;
        tkn.col=col;
        strcpy(tkn.type, "STRING LITERAL");
        int k = 1;
        tkn.lexeme[0] = '"';
        while((c = fgetc(fa)) != EOF && c != '"')
        {
                tkn.lexeme[k++] = c;
                ++col;
        }
        tkn.lexeme[k] = '"';
        gotToken = 1;
}
else if(c == '<' || c == '>' || c == '!')
{
        fillToken(&tkn, c, row, col, "RELATIONALOPERATOR");
        ++col;
        int d = fgetc(fa);
        if(d == '=')
        {
                ++col;
                strcat(tkn.lexeme, "=");
        }
        else
        {
                if(c == '!')
                {
                        strcpy(tkn.type, "LOGICALOPERATOR");
                }
                fseek(fa, -1, SEEK_CUR);
        }
        gotToken = 1;
}
else if(c == '&' || c == '|')
{
        int d = fgetc(fa);
        if(c == d)
        {
                        tkn.lexeme[0] = tkn.lexeme[1] = c;
                        tkn.lexeme[2] = '\0';
                        tkn.row = row;
```

```
                                        tkn.col = col;
                                        ++col;
                                        gotToken = 1;
                                        strcpy(tkn.type, "LOGICALOPERATOR");
                                }
                                else
                                {
                                        fseek(fa, -1, SEEK_CUR);
                                }
                                ++col;
                        }
                        else
                        {
                                ++col;
                        }
                }
                return tkn;
}



// main


#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
#include "la.h"

void program();
void declarations();
void datatype();
void idlist();
void idlistprime();
void assignstat();
void statementlist();
void statement();
void expn();
void eprime();
void simpleexp();
void seprime();
void term();
void tprime();
void factor();
void relop();
void addop();
void mulop();
struct token tkn;
FILE *f1;
char *rel[]={"==","!=","<=",">=",">","<"};
char *add[]={"+","-"};
```

```
char *mul[]={"*","/","%"};
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;
}
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;
}
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;
}
int main()
{
	FILE *fa, *fb;
   int ca, cb;
   fa = fopen("input.c", "r");
   if (fa == NULL){
      printf("Cannot open file \n");
      exit(0);
   }

   fb = fopen("output.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("output.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("output.c", "w");
            ca = getc(fa);
            while(ca != EOF){
                    putc(ca, fb);
                    ca = getc(fa);
            }
            fclose(fa);
            fclose(fb);
            remove("temp.c");
            f1=fopen("output.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;
                    }else{
                            printf("Missing main function\n");
                            break;
                    }
            }
    fclose(f1);
}
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();
					statementlist();
					if(strcmp(tkn.lexeme,"}")==0)
					{
						printf("Compiled successfully");
						return;
					}
					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);
			}
		}
		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
	{
		printf("; missing at row=%d col=%d",tkn.row,tkn.col);
		exit(1);
	}
}
void datatype()
{
	if(strcmp(tkn.lexeme,"int")==0)
	{
		tkn=getNextToken(f1);
		return;
	}
	else if(strcmp(tkn.lexeme,"char")==0)
	{
		tkn=getNextToken(f1);
		return;
	}
	else
	{
		printf("%s Missing datatype at row=%d col=%d",tkn.lexeme, tkn.row,tkn.col);
		exit(1);
	}
}
void idlist()
{
	if(strcmp(tkn.type,"IDENTIFIER")==0)
	{
		tkn=getNextToken(f1);
		idlistprime();
	}
	else
	{
		printf("Missing IDENTIFIER at row=%d col=%d",tkn.row,tkn.col);
	}
}
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)
			{
```

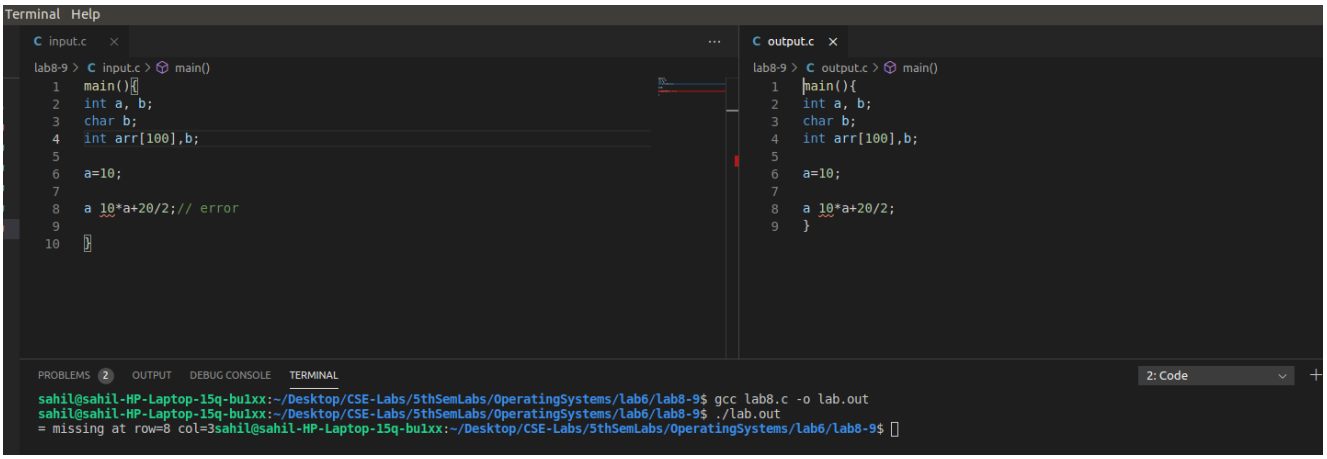
```
                        tkn=getNextToken(f1);
                        if(strcmp(tkn.lexeme,",")==0)
                        {
                                tkn=getNextToken(f1);
                                idlist();
                        }
                        else
                        {
                                return;
                        }
                }
        }
    }
    else
    {
        return;
    }
}
void statementlist()
{
    if(strcmp(tkn.type,"IDENTIFIER")!=0)
    {
        return;
    }
    statement();
    statementlist();
}
void statement()
{
    assignstat();
    if(strcmp(tkn.lexeme,";")==0)
    {
        tkn=getNextToken(f1);
        return;
    }
}
void assignstat()
{
    if(strcmp(tkn.type,"IDENTIFIER")==0)
    {
        tkn=getNextToken(f1);
        if(strcmp(tkn.lexeme,"=")==0)
        {
            tkn=getNextToken(f1);
            expn();
        }
        else
        {
            printf("= missing at row=%d col=%d",tkn.row,tkn.col);
            exit(1);
        }
    }
```

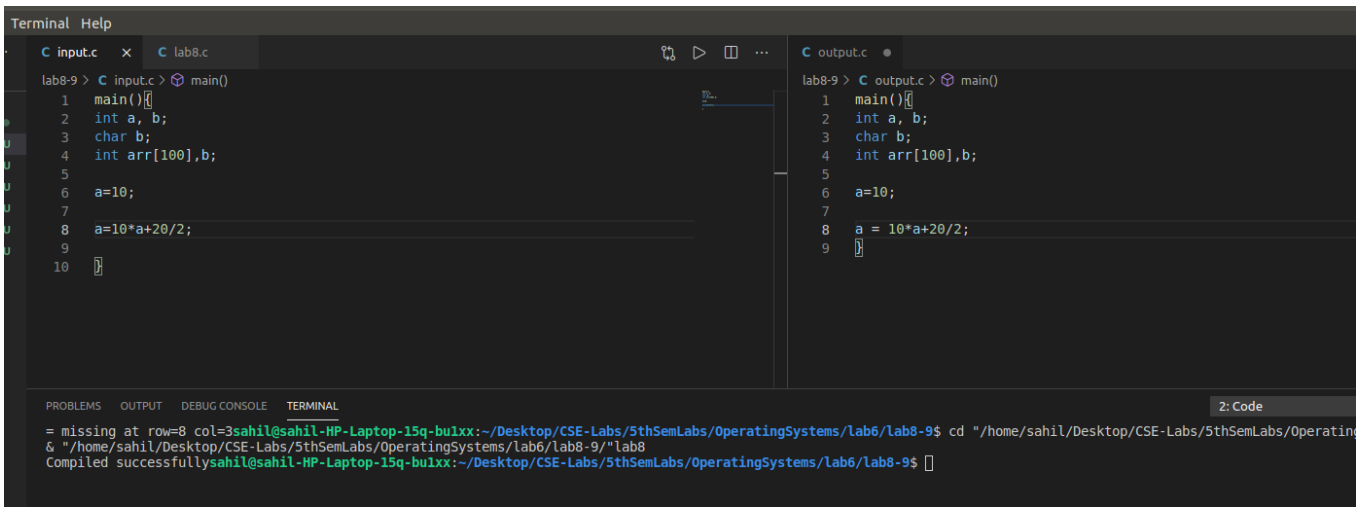
```
	else
	{
		printf("Missing IDENTIFIER at row=%d col=%d",tkn.row,tkn.col);
		exit(1);
	}
}
void expn()
{
	simpleexp();
	eprime();
}
void eprime()
{
	if(isrel(tkn.lexeme)==0)
	{
		return;
	}
	relop();
	simpleexp();
}
void simpleexp()
{
	term();
	seprime();
}
void seprime()
{
	if(isadd(tkn.lexeme)==0)
	{
		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 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;
        }
}
```

Output:




Terminal Help
input.c
lab8.c
lab8-9 > input.c > main()
main(){
int a, b;
char b;
int arr[100],b;
a=10;
a=10*a+20/2;
}
output.c
lab8-9 > output.c > main()
main(){
int a, b;
char b;
int arr[100],b;
a=10;
a = 10*a+20/2;
}
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
2: Code
= missing at row=8 col=3sahil@sahil-HP-Laptop-15q-bu1xx:~/Desktop/CSE-Labs/5thSemLabs/OperatingSystems/lab6/lab8-9$ cd "/home/sahil/Desktop/CSE-Labs/5thSemLabs/Operatin
& "/home/sahil/Desktop/CSE-Labs/5thSemLabs/OperatingSystems/lab6/lab8-9/"lab8
Compiled successfullysahil@sahil-HP-Laptop-15q-bu1xx:~/Desktop/CSE-Labs/5thSemLabs/OperatingSystems/lab6/lab8-9$

//END//////////////////////////////////////