EXP NO:7 **DATE:**

RECOGNIZE A VALID CONTROL STRUCTURES SYNTAX OF C LANGUAGE (FOR LOOP, WHILE LOOP, IF-ELSE, IF-ELSE-IF, SWITCH CASE, ETC.,

AIM:

To design and implement a LEX and YACC program that recognizes the syntax of common control structures in C programming, including:
For loop
While loop
If-else
If-else-if
Switch-case

ALGORITHM:

LEX (Lexical Analyzer)

1. Start
2. Define token patterns for:
    o Keywords (e.g., if, else, for, while, switch, case)
    o Identifiers (variable names)
    o Operators (arithmetic and relational)o Parentheses ((), {}, etc.)
    o Semicolon (;)
3. Pass recognized tokens to YACC for syntax validation.
4. End

YACC (Syntax Analyzer)

1. Start
2. Define grammar rules for:
    o For loop: for(initialization; condition; increment) { ... }
    o While loop: while(condition) { ... }
    o If-else: if(condition) { ... } else { ... }
    o If-else-if: if(condition) { ... } else if(condition) { ... } else { ... }
    o Switch-case: switch(expression) { case value: ... default: ... }
3. Parse the input expression and validate the syntax of the control structures.
4. Print appropriate messages for valid or invalid control structure syntax.
5. End

PROGRAM:

LEX File (control_structures.l):
```
%{
#include "y.tab.h"
%}
%%
"if" { return IF; }
"else" { return ELSE; }
"for" { return FOR; }
"while" { return WHILE; }
"switch" { return SWITCH; }
"case" { return CASE; }
[a-zA-Z_][a-zA-Z0-9_]* { return IDENTIFIER; }
"=="|"!="|"<="|">="|"<"|">" { return REL_OP; }
"+"|"-"|"*"|"/" { return ARITH_OP; }
```

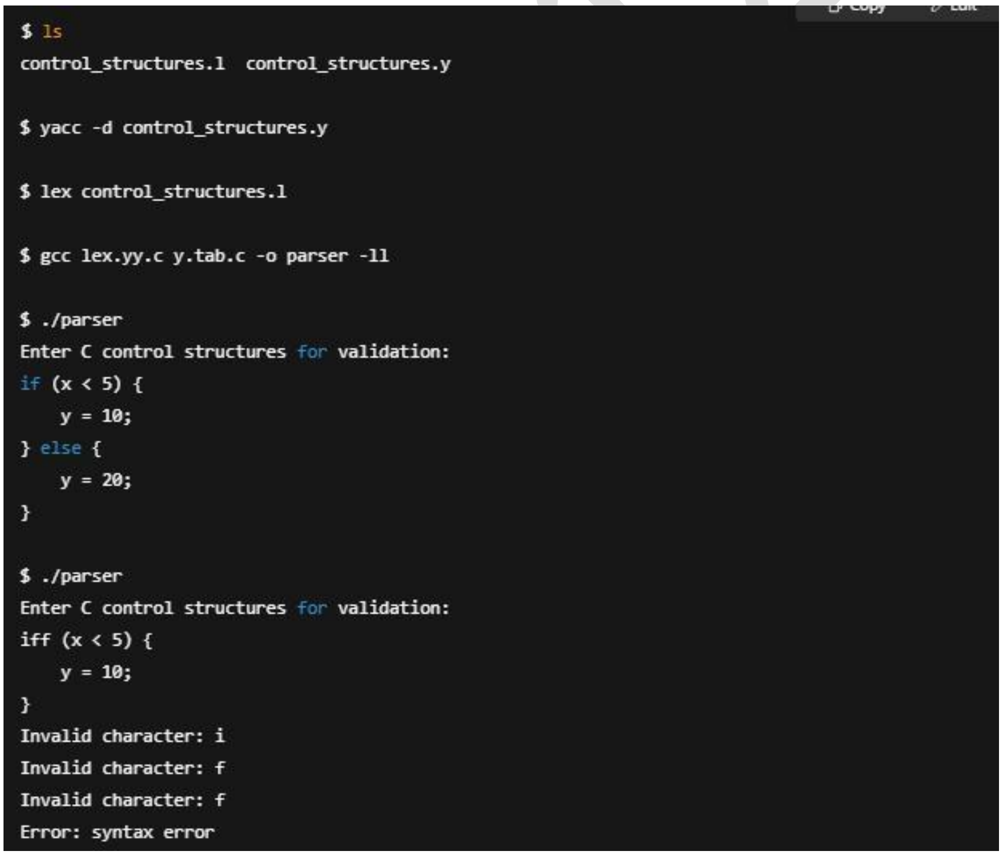
```
"(" { return LPAREN; }
")" { return RPAREN; }
"{" { return LBRACE; }
"}" { return RBRACE; }
";" { return SEMICOLON; }
[ \t\n] ; /* Ignore whitespace */
. { printf("Invalid character: %s\n", yytext); }
%%
int yywrap() {
return 1;
}
```

YACC File (control_structures.y)

```
%{
#include <stdio.h>
#include <stdlib.h>
void yyerror(const char *s);
int yylex(void);
%}
%token IF ELSE FOR WHILE SWITCH CASE IDENTIFIER REL_OP ARITH_OP
%token LPAREN RPAREN LBRACE RBRACE SEMICOLON
%start program
%%
program:
statement
| program statement
;
statement:
if_statement
| for_loop
| while_loop
| switch_case
;
if_statement:
IF LPAREN condition RPAREN LBRACE statements RBRACE
| IF LPAREN condition RPAREN LBRACE statements RBRACE ELSE LBRACE
statements RBRACE
;
for_loop:
FOR LPAREN assignment SEMICOLON condition SEMICOLON assignment RPAREN
LBRACE statements RBRACE
;
while_loop:
WHILE LPAREN condition RPAREN LBRACE statements RBRACE
;
switch_case:
SWITCH LPAREN expression RPAREN LBRACE case_statements RBRACE
;
case_statements:
CASE expression COLON statements
| case_statements CASE expression COLON statements
| case_statements DEFAULT COLON statements
;
condition:
IDENTIFIER REL_OP IDENTIFIER
| IDENTIFIER REL_OP NUMBER
| NUMBER REL_OP IDENTIFIER
| NUMBER REL_OP NUMBER
```

```
;
assignment:
IDENTIFIER '=' expression
;
expression:
IDENTIFIER
| NUMBER
| expression ARITH_OP expression
;
statements:
statement
| statements statement
;
%%
void yyerror(const char *s) {
fprintf(stderr, "Error: %s\n", s);
}
int main() {
printf("Enter C control structures for validation:\n");
yyparse();
return 0;
}
```

OUTPUT:



```
$ ls
control_structures.l  control_structures.y

$ yacc -d control_structures.y

$ lex control_structures.l

$ gcc lex.yy.c y.tab.c -o parser -ll

$ ./parser
Enter C control structures for validation:
if (x < 5) {
    y = 10;
} else {
    y = 20;
}

$ ./parser
Enter C control structures for validation:
iff (x < 5) {
    y = 10;
}
Invalid character: i
Invalid character: f
Invalid character: f
Error: syntax error
```

RESULT:

Thus the above program to recognize a valid control structures syntax of c language (for loop, while loop, if-else, if-else-if, switch case as been implemented and executed successfully with LEX and YACC.