

EXP NO: 07

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

YACC (Syntax Analyzer)

1. Start
2. Define grammar rules for:
 - For loop: for(initialization; condition; increment) { ... }
 - While loop: while(condition) { ... }
 - If-else: if(condition) { ... } else { ... }
 - If-else-if: if(condition) { ... } else if(condition) { ... } else { ... }
 - 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:

Control.l

```
%{
#include "control.tab.h"
#include <string.h>
#include <stdlib.h>
%}

%%

"if"      { return IF; }
"else"    { return ELSE; }
"while"   { return WHILE; }
"for"     { return FOR; }

"<="      { return LE; }
">="      { return GE; }
"=="      { return EQ; }
"!="      { return NE; }

[a-zA-Z_][a-zA-Z0-9_]* { yylval.str = strdup(yytext); return ID; }
[0-9]+      { yylval.str = strdup(yytext); return NUM; }

"="        { return '='; }
"+"        { return '+'; }
"_"        { return '-'; }
"*"        { return '*'; }
"/"        { return '/'; }
"<"        { return '<'; }
">"        { return '>'; }

"("        { return '('; }
")"        { return ')'; }
"{"        { return '{'; }
"}"        { return '}'; }
";"        { return ';'; }

[ \t\n]+   { /* ignore whitespace */ }
.          { return yytext[0]; }
%%

int yywrap() { return 1; }
```

control.y

```

%{
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

void yyerror(const char* s);
int yylex();
extern FILE* yyin;
}%

%union {
    char* str;
}

%token <str> ID NUM
%token IF ELSE WHILE FOR
%token LE GE EQ NE

%left '<' '>' LE GE EQ NE
%left '+' '-'
%left '*' '/'

%%

program:
    stmt_list
    ;

stmt_list:
    stmt
    | stmt_list stmt
    ;

stmt:
    expr ';' { /* Expression statement - skip message */ }
    | IF '(' expr ')' stmt { printf("IF condition works\n"); }
    | IF '(' expr ')' stmt ELSE stmt { printf("IF-ELSE condition works\n"); }
    | WHILE '(' expr ')' stmt { printf("WHILE loop works\n"); }
    | FOR '(' expr ';' expr ';' expr ')' stmt { printf("FOR loop works\n"); }
    | '{' stmt_list '}' { /* Compound statement - no message needed */ }
    ;

expr:
    ID '=' expr
    | expr '+' expr
    | expr '-' expr
    | expr '*' expr

```

```

| expr '/' expr
| expr '<' expr
| expr '>' expr
| expr LE expr
| expr GE expr
| expr EQ expr
| expr NE expr
| ID
| NUM
;
%%

void yyerror(const char* s) {
    printf("Syntax Error: %s\n", s);
}

int main() {
    printf("Enter a C control structure (Ctrl+Z to stop):\n");
    yyin = stdin; // set to standard input
    yyparse();
    return 0;
}

```

OUTPUT :

```

yacc -d control_structures.y
lex control_structures.l
gcc lex.yy.c y.tab.c -o control_validator
./control_validator

```

```

if (a > b) {
    // statements
} else {
    // statements
}

for (int i = 0; i < 10; i++) {
    // statements
}

```

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.