**Exercise – 11**

**Convert the BNF rules into YACC form and write code to generate abstract syntax**

**Tree**

**Program**:

**Save this color part as int.l**

%{

#include"y.tab.h"

#include<stdio.h>

#include<string.h>

int LineNo=1;

%}

identifier [a-zA-Z][\_a-zA-Z0-9]\*

number [0-9]+|([0-9]\*\.[0-9]+)

%%

main\(\) return MAIN;

if return IF;

else return ELSE;

while return WHILE;

int |

char |

float return TYPE;

{identifier} {strcpy(yylval.var,yytext);

return VAR;}

{number} {strcpy(yylval.var,yytext);

return NUM;}

\< |

\> |

\>= |

\<= |

== {strcpy(yylval.var,yytext);

return RELOP;}

[ \t] ;

\n LineNo++;

. return yytext[0];

%%

**Save this color part as int.y**

%{

#include<string.h>

#include<stdio.h>

struct quad

{

char op[5];

char arg1[10];

char arg2[10];

char result[10];

}QUAD[30];

struct stack

{

int items[100];

int top;

}stk;

int Index=0,tIndex=0,StNo,Ind,tInd;

extern int LineNo;

%}

%union

{

char var[10];

}

%token <var> NUM VAR RELOP

%token MAIN IF ELSE WHILE TYPE

%type <var> EXPR ASSIGNMENT CONDITION IFST ELSEST WHILELOOP

%left '-' '+'

%left '\*' '/'

%%

PROGRAM : MAIN BLOCK

;

BLOCK: '{' CODE '}'

;

CODE: BLOCK

| STATEMENT CODE

| STATEMENT

;

STATEMENT: DESCT ';'

| ASSIGNMENT ';'

| CONDST

| WHILEST

;

DESCT: TYPE VARLIST

;

VARLIST: VAR ',' VARLIST

| VAR

;

ASSIGNMENT: VAR '=' EXPR{

strcpy(QUAD[Index].op,"=");

strcpy(QUAD[Index].arg1,$3);

strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,$1);

strcpy($$,QUAD[Index++].result);

}

;

EXPR: EXPR '+' EXPR {AddQuadruple("+",$1,$3,$$);}

| EXPR '-' EXPR {AddQuadruple("-",$1,$3,$$);}

| EXPR '\*' EXPR {AddQuadruple("\*",$1,$3,$$);}

| EXPR '/' EXPR {AddQuadruple("/",$1,$3,$$);}

| '-' EXPR {AddQuadruple("UMIN",$2,"",$$);}

| '(' EXPR ')' {strcpy($$,$2);}

| VAR

| NUM

;

CONDST: IFST{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

}

| IFST ELSEST

;

IFST: IF '(' CONDITION ')' {

strcpy(QUAD[Index].op,"==");

strcpy(QUAD[Index].arg1,$3);

strcpy(QUAD[Index].arg2,"FALSE");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

}

BLOCK {

strcpy(QUAD[Index].op,"GOTO");

strcpy(QUAD[Index].arg1,"");

strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

};

ELSEST: ELSE{

tInd=pop();

Ind=pop();

push(tInd);

sprintf(QUAD[Ind].result,"%d",Index);

}

BLOCK{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

};

CONDITION: VAR RELOP VAR {AddQuadruple($2,$1,$3,$$);

StNo=Index-1;

}

| VAR

| NUM

;

WHILEST: WHILELOOP{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",StNo);

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

}

;

WHILELOOP: WHILE '(' CONDITION ')' {

strcpy(QUAD[Index].op,"==");

strcpy(QUAD[Index].arg1,$3);

strcpy(QUAD[Index].arg2,"FALSE");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

}

BLOCK {

strcpy(QUAD[Index].op,"GOTO");

strcpy(QUAD[Index].arg1,"");

strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

}

;

%%

extern FILE \*yyin;

int main(int argc,char \*argv[])

{

FILE \*fp;

int i;

if(argc>1)

{

fp=fopen(argv[1],"r");

if(!fp)

{

printf("\n File not found");

exit(0);

}

yyin=fp;

}

yyparse();

printf("\n\n\t\t ----------------------------""\n\t\t Pos Operator Arg1 Arg2 Result" "\n\t\t

--------------------");

for(i=0;i<Index;i++)

{

printf("\n\t\t %d\t %s\t %s\t %s\t

%s",i,QUAD[i].op,QUAD[i].arg1,QUAD[i].arg2,QUAD[i].result);

}

printf("\n\t\t -----------------------");

printf("\n\n");

return 0;

}

void push(int data)

{

stk.top++;

if(stk.top==100)

{

printf("\n Stack overflow\n");

exit(0);

}

stk.items[stk.top]=data;

}

int pop()

{

int data;

if(stk.top==-1)

{

printf("\n Stack underflow\n");

exit(0);

}

data=stk.items[stk.top--];

return data;

}

void AddQuadruple(char op[5],char arg1[10],char arg2[10],char result[10])

{

strcpy(QUAD[Index].op,op);

strcpy(QUAD[Index].arg1,arg1);

strcpy(QUAD[Index].arg2,arg2);

sprintf(QUAD[Index].result,"t%d",tIndex++);

strcpy(result,QUAD[Index++].result);

}

yyerror()

{

printf("\n Error on line no:%d",LineNo);

}

Input:

$vi test.c

main()

{

int a,b,c;

if(a<b)

{

a=a+b;

}

while(a<b)

{

a=a+b;

}

if(a<=b)

{

c=a-b;

}

else

{

c=a+b;

}

}

Output:

$lex int.l

$yacc –d int.y

$gcc lex.yy.c y.tab.c –ll –lm

$./a.out test.c

**OUTPUT**

