Exercício 2 em aula Compiladores gramática G3

```c
typedef union {
    char    cadeia [20];
    int  i;
    int  indSimb;
    int  indQuadr;
    } YYSTYPE;


#define   NADA    9999

#define   FRACASSO  9998
typedef   enum {
        STO,
        J,
        JF
        } Operador;
struct Quadrupla {
    Operador  op;
    int    operando1;
    int    operando2;
    int    operando3;
    } quadrupla [ 100 ];
int prox = 0;/* próxima  quadr.
disponivel*/

typedef   enum {
    Variavel,
    Constante,
    Funcao
    } Entidade;
typedef enum {
    Alocar,
    Referenciar
    }AlocarOuReferenciar;
/*
TabSimb: 1ªs 50 entradas p símbolos do
fonte
e últimas 50 p/ var. temps*/
struct TabSimb {
    char nome [20];
    Entidade entidade;
    int valor;
    char tipo [20] tipo;
    } tabSimb [100];
int  indSimb,
      indTemp;
int  topTab = 0, //inicio simbs
    topTemp = 50;//inicio temps
void gera ( Operador codop,int end1,int
end2,int end3){
    quadrupla [prox].op = codop;
    quadrupla [prox].operando1 = end1;
    quadrupla [prox].operando2 = end2;
    quadrupla [prox].operando3 = end3;
    prox++;
};
void remenda(int posM,Operador codop,int
end1,int end2,int end3 )
{
    quadrupla [posM].op = codop;
    quadrupla [posM].operando1 = end1;
    quadrupla [posM].operando2 = end2;
    quadrupla [posM].operando3 = end3;
}
int buscaSimbTab (YYSTYPE simb, Entidade
vOUc, AlocarOuReferenciar aOUr){
int k;
for (k = 0;k < topTab; k++) {
    switch(vOUc) {
        case Variavel: if
(strcmp(simb.cadeia, tabSimb
    [k].identificador)==0)return (k);
    break;
        case Constante:
    if (simb.i == tabSimb[k].valor)
            return(k);
    break;
        default: break;
    }; // do switch
}; // do for
if (aOUr == Alocar)||(vOUc == Constante)
return (FRACASSO);
else { // variável ausente, aborta !
  if (vOUc == Variavel){
      printf("\n simbolo ausente %s
      \n",simb.cadeia);
      exit(0);
    }; // do if Variavel
    }; // do else
}; // da funcao
void incluiSimbTab(YYSTYPE simb,Entidade
vOUc){
int retorno;
retorno = buscaSimbTab (simb, vOUc,
Alocar);
if (retorno == FRACASSO ) {//simb deve
ser incluido
    if (vOUc == Constante)
        tabSimb [topTab].valor =
        simb.i;//vOUc eh Constante
        else//variável
        strcpy (tabSimb [topTab].nome,
        simb.cadeia);

    tabSimb [topTab].entidade = vOUc;
    retorno = topTab;
    topTab++;
    } // de FRACASSO,incluido novo símbolo
return (retorno)
}
int temp () {
char [4] nomeTemporaria;
strcpy(nomeTemporaria, "t");//prefixo
strcat(nomeTemporaria, itoa (topTemp-
50);// sufixo
strcpy(tabSimb [topTemp].nome,
nomeTemporaria);
tabSimb [topTemp].entidade = Temporario;
topTemp++;
return (topTemp-1);
};
```

Sintaxe original	Sintaxe alterada	Ações semânticas com uso de $ para atributos (Yacc-like)
0. L' → L	0. L' → L	{encerra();}
1. L → S ; L	1. L → S ; L	
2. L → S	2. L → S	
3. S → v = E	3. S → v = E	{$1. indSimb = incluiSimbTab ($1, Variavel); gera(STO, $3.indSimb,$1.indSimb,NADA)}
4. S → if E then T	4. S → s E t M T	{remenda ($4.indQuadr, JF, $2.indSimb, prox)}
5. S → while E do T	5. S → w N E M d T	{gera (J, $2.ind Quadr, NADA, NADA); remenda($4.indQuadr, JF, $3.indSimb,prox,NADA)}
6. E → v	6. E → v	{$$.indSimb = incluiSimbTab ($1, Variavel)}
7. E → n	7. E → n	{$$.indSimb = incluiSimbTab ($1, Constante)}
	8. M → ε	{$$.indQuadr = prox; prox++;}
	9. N → ε	{$$.indQuadr = prox;}
8. T → { L }	10. T → { L }	

Terminais associados	Programa fonte edentado na sintaxe original	Programa fonte edentado na sintaxe com os terminais abreviados
| ```
Terminais associados
while   w
do      d
if      s
then    t
``` | ```
a = 5;
b = 3;
if a then {
  while b do {
    b = 0
    };
  a = 0
  }
``` | ```
a = 5;
b = 3;
s a t {
  w b d {
    b = 0
    };
  a = 0
  }
``` |

As variáveis **a, b** correspondem ao terminal **v** e as constantes numéricas **5, 3** e **0** correspondem ao terminal **n**

Comportamento da pilha {simb, atrib, e estado}, preenchimento da tabela de símbolos, e geração do código correspondente, na forma de quádruplas (código com três operandos), nos passos da análise do trecho de programa, a seguir: "**a=5;b=3;s a t{ w b d{b=0};a=0}$**".

tabela laLR(1) para a G3

	L	S	E	M	N	T	;	v	=	s	w	n	{	}	t	d	$	
0	1	2					3			4	5							0
1																R_0		1
2							6							R_2		R_2		2
3									7									3
4			8				9					10						4
5				11			R_9					R_9						5
6	12	2					3			4	5							6
7			13				9					10						7
8															14			8
9							R_6						R_6	R_6	R_6	R_6		9
10							R_7						R_7	R_7	R_7	R_7		10
11			15				9					10						11
12														R_1		R_1		12
13							R_3							R_3		R_3		13
14				16									R_8					14
15				17											R_8			15
16					18								19					16
17																20		17
18							R_4							R_4		R_4		18
19	21	2					3			4	5							19
20					22								19					20
21														23				21
22							R_5							R_5		R_5		22
23							R_{10}							R_{10}		R_{10}		23
	L	S	E	M	N	T	;	v	=	s	w	n	{	}	t	d	$	

Tabela de Símbolos – observar que os atributos na pilha serão preenchidos com o índice da tabela

Índice	nome/valor	entidade: Cte/Variavel	Valor
0	5	Constante	
1	a	Variavel	
2	3	Constante	
3	b	Variavel	
4	0	Constante	
5			
...			

Acompanhamento do reconhecimento e da tradução para a entrada do prog fonte: "a=5;b=3;s a t{ w b d{b=0};a=0}$

	pilha sintática	entrada do prog.fonte	prox	i:[op op1 op2 op3]
1	{...,...,0}	a=5;b=3	0	
2	{...,...,0}{v,a,3}	=5;b=3;		
3	{...,...,0}{v,a,3}{=,...,7}	5;b=3;		
4	{...,...,0}{v,a,3}{=,...,7}{n,5,10}	;b=3;...		
5	{...,...,0}{v,a,3}{=,...,7}(E,0,13}			
6	{...,...,0}{S,...,2}		1	0:[STO,0,1,NADA]
7	{...,...,0}{S,...,2}{;,...,6}	b=3;s a		
8	{...,...,0}{S,...,2}{;,...,6}{v,b,3}	=3;s a		
9	{...,...,0}{S,...,2}{;,...,6}{v,b,3}{=,...,7}	3;s a		
10	{...,...,0}{S,...,2}{;,...,6}{v,b,3}{=,...,7}{n,3,10}	;s a t{		
11	{...,...,0}{S,...,2}{;,...,6}{v,b,3}{=,...,7}{E,2,13}			
12	{...,...,0}{S,...,2}{;,...,6}{S,...,2}		2	1:[STO,2,3,NADA]
13	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}	s a t{		
14	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}	a t{		
15	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{v,a,9}	t{ w b		
16	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }			
17	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}	{ w b		
18	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}		3	
19	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}	w b		
20	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}	b d{ b =		
21	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}			
22	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{v,b,9}	d { b =		
23	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }			
24	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}		4	
25	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}	{ b = 0		
26	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}	b = 0		
27	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{v,b,3}	= 0		
28	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{v,b,3}{=,...,7}	0 };a		
29	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{v,b,3}{=,...,7}{n,0,10}	};a =		
30	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{v,b,3}{=,...,7}{E,4,13}			

#	Stack	Input		Action
31	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{S,...,2}		5	4:[STO,4,3,NADA]
32	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{L,...,21 }			
33	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{{,...,19}{L,...,21} {},...,23}	; a =		
34	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{w,...,5}{N,3,11}{E,3,15 }{M,3,17}{d,...,20}{T,...,22}			
35	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}		6	5:[J,3,NADA,NADA] 3:[JF,3,6,NADA]
36	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}	a = 0}$		
37	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{v,a,3}	= 0 } $		
38	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{v,a,3}{=,...,7}	0 }$		
39	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{v,a,3}{=,...,7}{n,0,10}	}$		
40	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{v,a,3}{=,...,7}{E,4,13}			
41	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{S,...,2}		7	6:[STO,4,1,NADA]
42	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{S,...,2}{;,...,6}{L,...,12}			
43	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{L,...,21}			
44	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{{,...,19}{L,...,21}{},...,23}	$		
45	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{s,...,4}{E,1,8 }{t,...,14}{M,2,16}{T,...,18}			
46	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{S,...,2}			2:[JF,1,7,NADA]
47	{...,...,0}{S,...,2}{;,...,6}{S,...,2}{;,...,6}{L,...,12}			
48	{...,...,0}{S,...,2}{;,...,6}{L,...,12}			
49	{...,...,0}{L,...,1}			
50	{...,...,0}{L´			