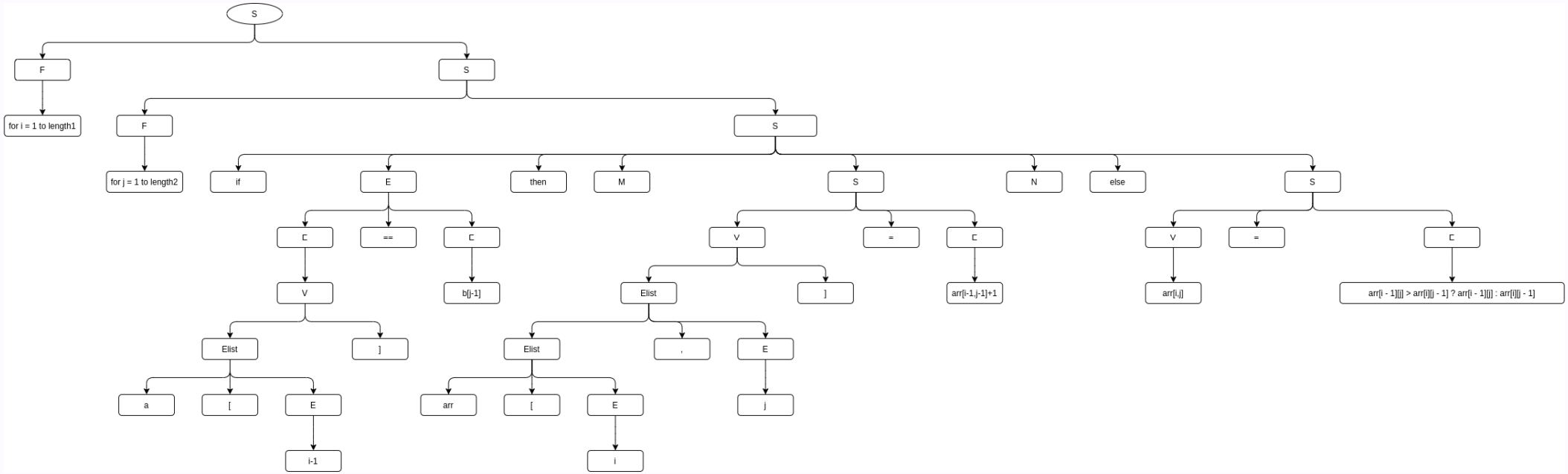
hw6

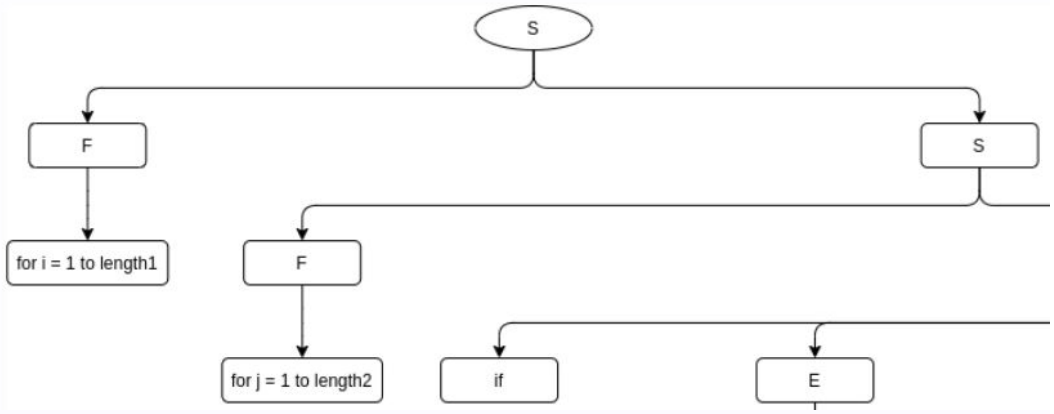
1. 针对以下C函数，给出其函数体三地址码

```
#define N 32

int a[N],b[N];
int arr[N+1][N+1];

void lcs() {
 for (i = 1; i <= length1; ++i) {
  for (j = 1; j <= length2; ++j) {
   if (a[i - 1] == b[j - 1]) { //串中的下标从0开始
    arr[i][j] = arr[i - 1][j - 1] + 1;
   } else {
    arr[i][j] = arr[i - 1][j] > arr[i][j - 1] ? arr[i - 1][j] : arr[i][j - 1];
   }
  }
 }
} // end of lcs()
```

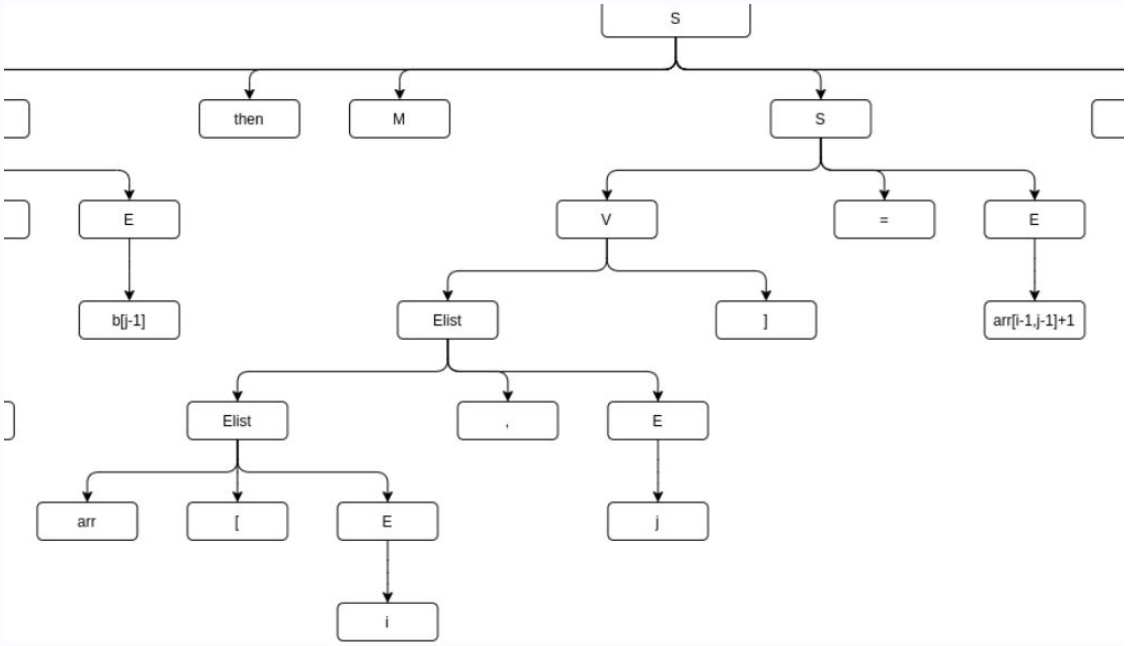
先画出语法树：


S
F
S
for i = 1 to length1
F
S
for j = 1 to length2
if
E
then
M
S
N
else
S
⊏
==
⊏
V
=
⊏
V
=
⊏
V
b[j-1]
Elist
]
arr[i-1,j-1]+1
arr[i,j]
arr[i - 1][j] > arr[i][j - 1] ? arr[i - 1][j] : arr[i][j - 1]
Elist
]
Elist
,
E
a
[
E
arr
[
E
j
i-1
i

```
i = 1
F1:
if i > length1 goto F
j = 1
F2:
if j > length2 goto F4
// a[i-1]
t0 = i - 1
t1 = a
t2 = t0 * 4
t3 = t1[t2]
// b[j-1]
t4 = j - 1
t5 = b
t6 = t4 * 4
t7 = t5[t6]
// a[i-1]==b[j-1]
if t7 == t3 goto M1
goto M2
```



```
M1:
// arr[i,j]
t8 = i * 33
t8 = t8 + j
t10 = arr
t11 = t8 * 4
// arr[i-1,j-1]+1
t12 = i - 1
t13 = j - 1
t14 = t12 * 33
t14 = t14 + t13
t15 = arr
t16 = t14 * 4
t17 = t15[t16]
t18 = t17 + 1
// arr[i,j] = arr[i-1,j-1]+1
t10[t11] = t18
```

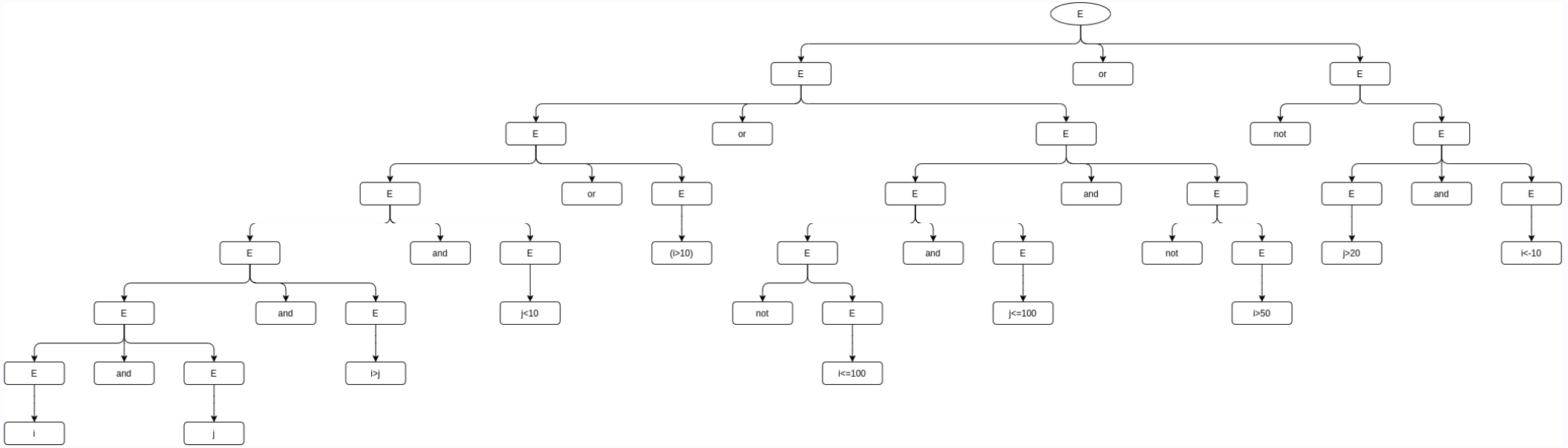


```
goto F3
M2:
// else里面的数组太多了，就不用三地址码一个个计算了
// ?:语句人肉汇编一下
if arr[i-1][j]>arr[i][j-1] goto L1
arr[i][j] = arr[i][j-1]
goto F3
L1:
arr[i][j] = arr[i-1][j]
// if else语句归约，填充之前的truelist和flaselist
// for语句归约
F3:
j = j + 1
goto F2
F4:
i = i + 1
goto F1
```

2. 按要求给出以下C表达式的三地址代码

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

语法树


E
E
or
E
E
or
E
not
E
E
or
E
E
and
E
E
and
E
E
and
E
E
and
E
E
and
E
(i>10)
E
and
E
j<10
E
and
E
not
E
j<=100
E
not
E
j>20
i<-10
E
and
E
i>j
E
and
E
i<=100
E
and
E
i>50
E
and
E
i
j

2.1 数值计算方式

第十讲 中间代码生成（2）p5~p9的代码翻译方案

```
// i
if i goto L0
t0 = 0
goto L1
L0:
t0 = 1
L1:

// j
if j goto L2
t1 = 0
goto L3
L2:
t1 = 1
L3:

t2 = t0 and t1

// i>j
if i > j goto L4
t3 = 0
goto L5
L4:
t3 = 1
L5:

t4 = t2 and t3
```

```
// j<10
if j < 10 goto L6
t5 = 0
goto L7
L6:
t5 = 1
L7:

t6 = t4 and t5

// (i>10)
if i > 10 goto L8
t7 = 0
goto L9
L8:
t7 = 1
L9:

t8 = t6 or t7

// i<=100
if i <= 100 goto L10
t9 = 0
goto L11
L10:
t9 = 1
L11:
```

```
t10 = not t9

// j<=100
if j <= 100 goto L12
t11 = 0
goto L13
L12:
t11 = 1
L13:

t12 = t10 and t11

// i>50
if i>50 goto L14
t13 = 0
goto L15
L14:
t13 = 1
L15:

t14 = not t13
t15 = t12 and t14
t16 = t8 or t15
```

```
// j>20
if j>20 goto L16
t17 = 0
goto L17
L16:
t17 = 1
L17:

// i<-10
if i < -10 goto L18
t18 = 0
goto L19
L18:
t18 = 1
L19:

t19 = t17 and t18
t20 = not t19
t22 = t17 or t20
```

2.2 短路计算方式

a. 第十讲 中间代码生成（2）p18~p20翻译方案

```
if i goto L0
goto L3
L0:
if j goto L1
goto L3
L1:
if i>j goto L2
goto L3
L2:
if j<10 goto T
goto L3
L3:
if i>10 goto T
goto L4
```

```
L4:
if i<=100 goto L7
goto L5
L5:
if j<= 100 goto L6
goto L7
L6:
if i>50 goto L7
goto T
L7:
if j>20 goto L8
goto T
L8:
if i<-10 goto F
goto T
```

部分过程

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto T
goto F
L0:
if j goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto T
goto F
L1:
if i>j goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto L1
goto F
L1:
if i>j goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto L1
goto F
L1:
if i>j goto T
goto F
L2:
if j<10 goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto L1
goto F
L1:
if i>j goto L2
goto F
L2:
if j<10 goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto F
L0:
if j goto L1
goto F
L1:
if i>j goto L2
goto F
L2:
if j<10 goto T
goto F
L3:
if i> 10 goto T
goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if i goto L0
goto L3
L0:
if j goto L1
goto L3
L1:
if i>j goto L2
goto L3
L2:
if j<10 goto T
goto L3
L3:
if i> 10 goto T
goto F
```

b. 第十讲 中间代码生成（2）p21~p27，更精简的短路代码翻译方案

```
if !i goto L0
if !j goto L0
if i<=j goto L0
if j<10 goto T
L0:
if i>10 goto T
if i<=100 goto L1
if j>100 goto L1
if i<=50 goto T
L1:
if j<=20 goto T
if i>=-10 goto T
```

部分过程

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if !i goto F
if !j goto F
if i<=j goto F
if j>=10 goto F
L0:
if i<=10 goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if !i goto L0
if !j goto L0
if i<=j goto L0
if j>=10 goto L0
L0:
if i<=10 goto F
```

i && j && i > j && j < 10 || (i>10) || !(i <= 100) && (j <= 100) && !(i>50) || !(j > 20 && i < -10)

```
if !i goto L0
if !j goto L0
if i<=j goto L0
if j<10 goto T
L0:
if i<=10 goto F
```

Thanks!