

# Homework 8

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## Exercise 1

针对以下 C 程序及其汇编代码： 补全下划线部分的 C 语句或汇编代码

```
int test(int i, int j)
{
    int score;
    if(_____)
        score = 100;
    else
        score = 60;
    return score;
} // C 程序
```

```

.text
.globl test
.type test, @function
test:
    pushl    %ebp
    movl     %esp, %ebp

    

---


    movl     8(%ebp), %eax
    cmpl     12(%ebp), %eax
    jle      .L4
    cmpl     $0, 12(%ebp)
    je       .L4
    cmpl     $10, 12(%ebp)
    jle      .L4
    cmpl     $0, 8(%ebp)
    je       .L4
    cmpl     $20, 8(%ebp)
    jg       .L3
.L4:
    cmpl     $100, 8(%ebp)
    jg       .L3
    cmpl     $99, 12(%ebp)
    jle      .L2
    cmpl     $40, 8(%ebp)
    jg       .L2
    cmpl     $20, 12(%ebp)
    jle      .L3
    cmpl     $-10, 8(%ebp)
    jge      .L3
    jmp      .L2
.L3:
    movl     $100, -4(%ebp)
    jmp      .L5
.L2:
    movl     $60, -4(%ebp)
.L5:
    

---


    leave
    ret

```

解 补全后的代码如下

```
int test(int i, int j)
{
    int score;
    if(i > j && j != 0 && j > 10 &&
       i != 0 && i > 20 || i > 100
       || (j >= 100 && i <= 40) &&
       (j <= 20 || i >= -10))
        score = 100;
    else
        score = 60;
    return score;
} // C 程序
```

```
.text
.globl test
.type test, @function
test:
    pushl    %ebp
    movl     %esp, %ebp
    subl     $16, %esp
    movl     8(%ebp), %eax
    cmpl     12(%ebp), %eax
    jle      .L4
    cmpl     $0, 12(%ebp)
    je       .L4
    cmpl     $10, 12(%ebp)
    jle      .L4
    cmpl     $0, 8(%ebp)
    je       .L4
    cmpl     $20, 8(%ebp)
    jg       .L3
.L4:
    cmpl     $100, 8(%ebp)
    jg       .L3
    cmpl     $99, 12(%ebp)
    jle      .L2
    cmpl     $40, 8(%ebp)
    jg       .L2
    cmpl     $20, 12(%ebp)
    jle      .L3
    cmpl     $-10, 8(%ebp)
    jge      .L3
    jmp      .L2
.L3:
    movl     $100, -4(%ebp)
    jmp      .L5
.L2:
    movl     $60, -4(%ebp)
.L5:
    movl     -4(%ebp), %eax
    leave
    ret
```

## Exercise 2

给出生成如下 C 风格for语句中间代码的翻译方案；假定代码生成的顺序不变。

$$S \rightarrow \text{for}(E_1; E_2; E_3) S_1$$

解 首先给出中间代码的结构

```

       $E_1$ 
L1: if  $E_2$  goto L3
L2:  $E_3$ 
      goto L1
L3:  $S_1$ 
      goto L2
```

据此给出一个翻译方案如下

```

$$S \rightarrow \text{for}(E_1; M_1 E_2; M_2 E_3) N S_1$$
  
    {  
        emit('goto',  $M_2.\text{next}$ );  
        backpatch( $E_2.\text{truelist}$ ,  $N.\text{next}$ );  
        backpatch( $S_1.\text{nextlist}$ ,  $M_2.\text{next}$ );  
        backpatch( $N.\text{nextlist}$ ,  $M_1.\text{next}$ );  
         $S.\text{nextlist} = E_2.\text{falselist}$ ;  
    }  
 $M \rightarrow \varepsilon$   
    {  $M.\text{next} = \text{nextstmt}$ ; }  
 $N \rightarrow \varepsilon$   
    {  
         $N.\text{nextlist} = \text{makelist}(\text{nextstmt})$ ;  
        emit('goto');  
         $N.\text{next} = \text{nextstmt}$ ;  
    }
```