

Problem 1

Write HCL code for the signal `f_stat`, providing the provisional status for the fetched instruction.

Problem 2

Write HCL code for the signal `E_bubble` in the PIPE implementation.

Problem 3

Suppose the order of the third and fourth cases (the two forwarding sources from the memory stage) in the HCL code for `d_valA` were reversed, as follows in table 1. Describe the resulting behavior of the `rrmovl` instruction (line 5) for the following program:

```
Int d_valA = [  
    D_icode in { ICALL, IJXX } : D_valP;  
    d_srcA == e_dstE : e_valE;  
    d_srcA == M_dstM : m_valM;  
    d_srcA == M_dstE : M_valE;  
    d_srcA == W_dstM : W_valM;  
    d_srcA == W_dstE : W_valE;  
    1 : d_rvalA;  
];
```

table 1

```
1      irmovl    $5, %edx  
2      irmovl    $0x100, %esp  
3      rmmovl    %edx, 0(%esp)  
4      popl      %esp  
5      rrmovl    %esp, %eax
```

Problem 4

Suppose we have a block of code, as follows in table 2. It will execute on a PIPE with stalling and forwarding.

```
irmovl $1, %edx
```

```
loop:  addl %eax, %edx  
       irmovl $2, %ecx  
       subl %edx, %ecx  
       je loop  
       ret
```

table 2

Write down the executing process of circle 3 and 5 according to the form in Figure 4.50 in ICS book.