

ICS Homework 5

March 15, 2022

1 Organization

1.1 Hazard

```
1  # demo.ys
2  0x000:      irmovq stack,%rsp
3  0x00a:      call p
4  0x013:      irmovq $5,%rsi
5  0x01d:      halt
6
7  0x020:..pos 0x20
8  0x020:p:    irmovq $-1,%rdi
9  0x02a:      ret #below will not be executed
10 0x02b:      irmovq $1,%rax
11 0x035:      irmovq $2,%rcx
12 0x03f:      irmovq $3,%rdx
13 0x049:      irmovq $4,%rbx
14
15 0x100:..pos 0x100
16 0x100:stack:
```

1. During executing the above example, how many hazards will happen? Please point them out.
2. How could the above data hazards be handled? Please describe in detail.
3. What is the difference between **stall** and **bubble**?

2 System Software

2.1 Signal

```
1  int counter = 2;
2
3  void handler1(int sig) {
4      counter = counter + 1;
5      printf("%d\n", counter);
6      exit(0);
7  }
8
9  int main() {
10     signal(SIGINT, handler1);
11     printf("%d\n", counter);
12     if ((pid = fork()) == 0) {
13         while(1) {};
14     }
15     kill(pid, SIGINT);
16
17     counter = counter - 1;
18     printf("%d\n", counter);
19     waitpid(-1, NULL, 0);
20     counter = counter + 1;
21     printf("%d\n", counter);
22     exit(0);
23 }
```

1. Please rewrite the *handler* according to the guidelines in section 8.5.5 (HINT: you can use *Sio_puts* as thread safe *printf* if needed).
2. Please write down all the possible outputs of the original programs.