

ICS Homework 4

March 18, 2021

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 handler

Jack writes the following code about a user-defined signal handler on a x86-64 Linux machine. Read this C program and answer the questions below.

```

1  #include <signal.h>
2  #include <sys/types.h>
3  #include <stdio.h>
4  #include <unistd.h>
5
6  void handler(int sig)
7  {
8      printf("hello\n");
9  }
10
11 int main(void)
12 {
13     signal(SIGINT, handler);
14     kill(getpid(), SIGINT);
15     while(1);
16     return 0;
17 }

```

1. Does the function 'handler' run in user mode or kernel mode?
2. What's the output of this program? When we type a 'ctrl-c', what will happen? How to use *kill* command to stop this program?
3. When we run this program in gdb, can we see the same result as Q2? If not, explain why and show how to fix it to get the same result in gdb as Q2.