

# NYCU Computer Organization HW 1

1. It is the compiler's job to associate program variables with registers. For instance, the assignment statement in below:

$f = (g + h) - (i + j);$

The variables  $f$ ,  $g$ ,  $h$ ,  $i$ , and  $j$  are assigned to the registers  $x19$ ,  $x20$ ,  $x21$ ,  $x22$ , and  $x23$ , respectively. What is the compiled RISC-V code?

2. Assume variable  $h$  is associated with register  $x21$  and the base address of the array  $A$  is in  $x22$ . What is the RISC-V assembly code for the C assignment statement below?

$A[12] = h + A[8];$

3. What is the decimal value of this 32-bit two's complement number?

11111111 11111111 11111111 11111100<sub>two</sub>

4. Convert 16-bit binary versions of  $2_{ten}$  and  $-2_{ten}$  to 32-bit binary numbers

5. In the following code segment,  $f$ ,  $g$ ,  $h$ ,  $i$ , and  $j$  are variables. If the five variables  $f$  through  $j$  correspond to the five registers  $x19$  through  $x23$ , what is the compiled RISC-V code for this C if statement? (using 'bne', and 'beq' instructions)

if ( $i == j$ )  $f = g + h$ ; else  $f = g - h$ ;

6. Here is a traditional loop in C:

```
while (save[i] == k)
```

```
    i += 1;
```

Assume that  $i$  and  $k$  correspond to registers  $x22$  and  $x24$  and the base of the array  $save$  is in  $x25$ . What is the RISC-V assembly code corresponding to this C code? (using `slli`, `bne`, and `beq` instructions)