

CS2323: Computer Architecture, Autumn 2024

Homework-2: Conditionals and Memory access

1. Write a RISC-V assembly code to multiply two unsigned numbers present in registers x5 and x6, and generate the product in register x10. **NO** mul, div, rem, float instructions and **NO** pseudo instructions are allowed to be used. [4 marks]

2. Write the equivalent RISC-V assembly code for the following C-code. [6 marks]

```
while (p > q && A[i] != 0) {  
    if (A[i] <= 0)  
        p = p + A[i];  
    else  
        p = A[i];  
    i = i+2;  
}
```

Assume the values to be present in registers as shown below:

```
x11 = p  
x12 = q  
x13 = i  
x14 = base address of A
```

3. Consider the code given below. Assume that the .data section starts at address 0x10000000. What is the value of register x3 at each step after the main label? A brief (1-line explanation) for each step should be provided. [10 marks]

The entire value of 16 hex digits should be written for all cases. (e.g., 0x000000007f7f7f7f). 0x7f7f7f7f is not acceptable.

Hint: First, identify which byte goes to which address of the memory and then solve.

Be careful with lb/lh/lw/ld and lbu/lhu/lwu

```
.data  
.dword 0xa55aa5a593933939  
.dword 0x39933939a55aa5a5  
.text  
    lui x1, 0x10000  
main:  
    lhu x3, 0(x1)  
    lh x3, 0(x1)  
    lh x3, 2(x1)  
    ld x3, 0(x1)  
    lw x3, 12(x1)  
    lbu x3, 7(x1)  
    lb x3, 7(x1)  
    lb x3, 6(x1)  
    ld x3, 3(x1)  
    lwu x3, 6(x1)
```

Submission instructions:

1. Create a pdf file mentioning the reasoning/observations for the questions asked above.
2. The submission should be entirely your work
3. The pdf file should be named YOUR_ROLLNUM.pdf (e.g., CSYYBTECHXXXXX.pdf)
4. Submit the pdf file