Quiz-2   Full Marks: 15
Duration: 30 minutes

CSE 340: Computer Architecture

~~15~~
~~15~~
Excellent!

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1. **[CO2] Demonstrate** the equivalent RISCV code of the following code, where the base address of C and D is in x8 and x9, i, j and m are in x18, x19 and x20. *Note: You cannot use mul/div functions.*
   [9 marks]

   ```
   i=1;
   while ( C[i] > m ) {
     if(C[i] == D[j]) {
       C[i] = D[j] / 32;
     }
     else {
       D[j]= C[i] * 16;
     }
     i++;
   }
   ```

   $C = x8$ $i = x18$
   $D = x9$ $j = x19$
                   $m = x20$

2. **[CO2] Determine** the type of Instruction and the equivalent machine code of the following ~~MIPS~~ RISCV instruction.
   [6 marks]

   ```
   srli x7, x21, 6
   addi x9, x29, -9
   sd x8, 56 (x22)
   ```

   Note: Use the following information for the necessary fields:

Instruction	Opcode	Funct3	Funct7/Immediate
srli	0010011	101	000000
addi	0010011	000	-
sd	0100011	011	-

①

1) addi X18, X0, 1 | X18 = i = 1

LOOP:

2) slli X31, X18, 3

3) add X31, X31, X8 | X31 has C[i]'s addr

4) ld X6, 0(X31) | X6 = C[i]

5) blt X6, X20, Exit

6) beq X6, X20, Exit

7) slli X7, X19, 3

8) add X7, X7, X9 | X7 has D[j]'s add

9) ld X29, 0(X7) | X29 = D[j]

10) beq X7, X6, If

11) slli X28, X6, 4 | executing else here
                        X28 = C[i]*16

12) sd X28, 0(X7) | D[j] = C[i] * 16

13) beq X0, X0, L1   Excellent!

If:

14) srli X29, X29, 5 | X29=D[j]/32

15) sd X29, 0(X31)   C[i] = D[j]/32

16) beq X0, X0, L1

L1:

17) addi X18, X18, 1   X18 = i + 1

18) beq X0, X0, Loop

Exit:

③ sd x8 , 56 (x22)

Type S:

| rs2 | rs1 | f3 | | opode |

| 0000001 | 01000 | 10110 | 011 | 11000 | 0100011 |

imm[11:5]   imm[4:0]
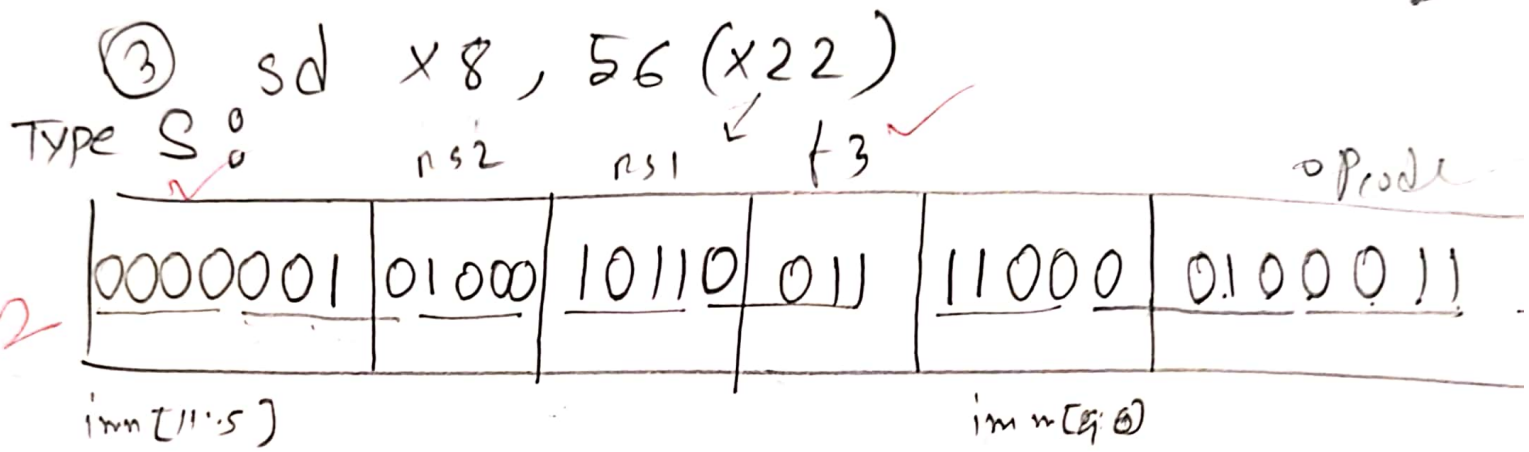
machine code:

028B3C23

Excellent

① Snli   x7, x21, 6
Type: i ✓

imm	rs1	f3	nd	opcode
0000000 00 0110	10101	101	00111	0010011
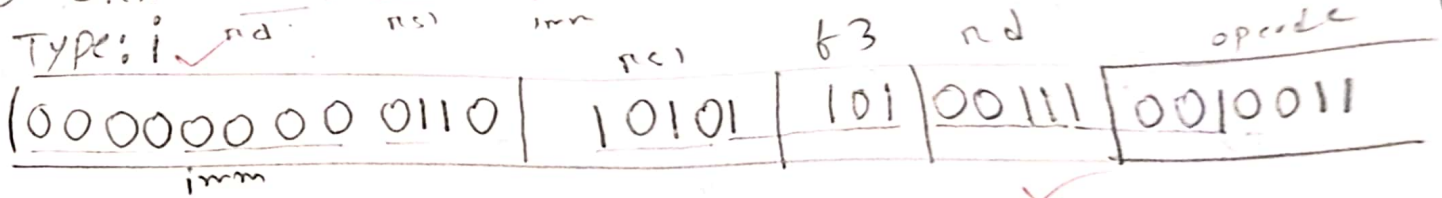
machine code:

0 0 6 A D 3 9 3 ✓

② addi   x9, x29, -9
Type: i ✓

imm	rs1	f3	nd	op
1 11111111 0111	11101	000	01001	0010011
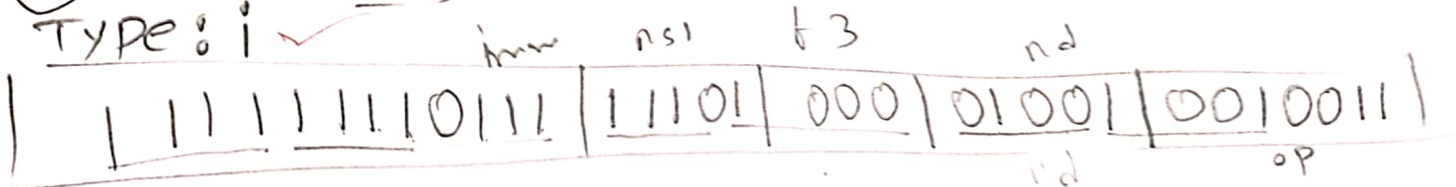
Rowth

9 =   01001
1's   10110
     +   1
     ────────
       10111

machine code

F F 7 E 8 4 9 3 ✓