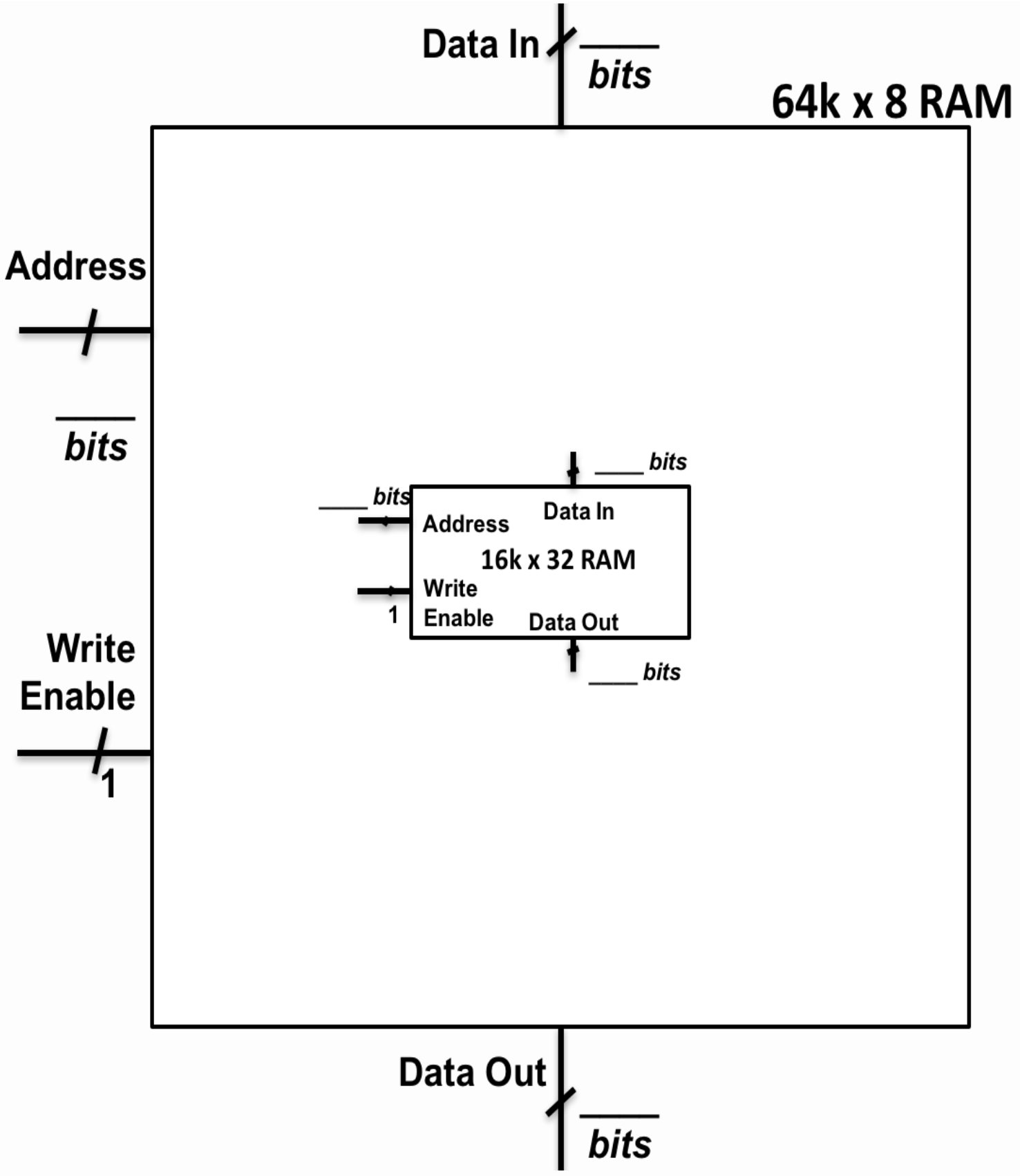
CS 240 Arch **ID Number:**

About how many hours did you spend actively working on this assignment? _____

1. Reconstructing Memories

1a. Draw a 256×8 RAM based on two 256×4 RAMs. Your logic will go inside the box.

1b. Draw a 64K×8 RAM based on one 16K×32 RAM.



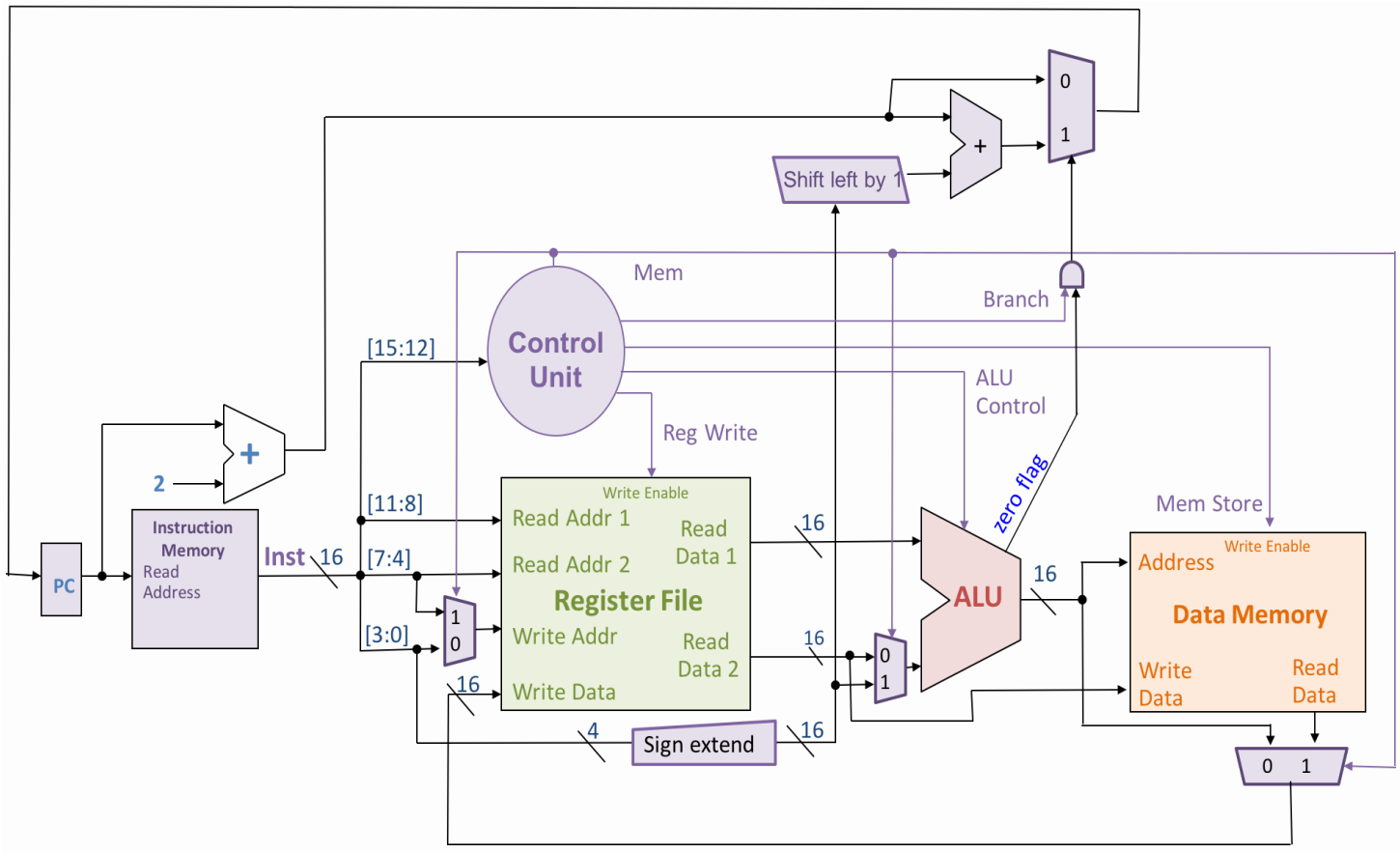
2. Taking Control

Control Unit Truth Table

Instruction Name	Opcode$_{[3:0]}$ (4 bits)	Reg Write (1 bit)	ALU Op$_{[3:0]}$ (4 bits)	Mem Store (1 bit)	Mem (1 bit)	Branch (1 bit)	Jump **(3a)** (1 bit)
LW							
SW							
ADD							
SUB							
AND							
OR							
BEQ							
JMP **(3a)**							
NAND **(4b)**							

3. Jumping into the Unknown

3a. Draw JMP logic and fill the JMP row in the control unit truth table above.



3b i. Execute this code, assuming `R2` holds 5 and `R3` holds 2. Indicate the final register values when the code reaches `HALT`.

```
0:  AND R2, R2, R4
2:  AND R3, R3, R5
4:  BEQ R5, R0, 3
6:  SUB R5, R1, R5
8:  ADD R4, R4, R4
A:  JMP 2
C:  HALT # Stops execution.
```

R2: _____ R3: _____ **R4:** _____ R5: _____

3b ii. Single line of C code equivalent to this code.

`R4 =` _____ `;`

4. Instruction Not Missing

4a. The instruction `NOT Rs,Rd` can be emulated by running the following instructions instead:

4b-c. NAND/NOT encoding and definition ---------- 16-bit encoding ----------

Assembly	Meaning	Opcode [15:12]	Rs [11:8]	Rt [7:4]	Rd [3:0]
(4b) `NAND Rs,Rt,Rd`	*`R[d] ← ~(Rs & Rt)`*				
(4c) `NOT Rs,Rd`	*`R[d] ← ~Rs`*				

5. Points Affixed and Afloat in a C of Numbers

(Check the assignment to see whether Part 5 is required.)

5a. Fixed point numbers **Sea Type**	Minimum (base ten)	Maximum (base ten)	**iii.** Adder (It fits! Reuse provided parts.)
i. `signed fixed8ths char`			
ii. `signed fixed32nds char`			

5b. Floating point conversion.

6-bit floating-point encoding	`110101`	`100001`	`011100`	`000011`	`010010`	`111101`
Decimal number represented						