Lab 6

Simple Computer Architecture (Part II)

Understand and trace the fetch-decode-execute (FDE) cycle.
Practice translating between high-level languages and assembly code.
Practice translating between assembly and machine code.

IN this lab, we build on Lab 4 by further exploring the SCA instruction set, focusing on tracing the Fetch-Decode-Execute cycle in detail.

Binary (8-bit Signed Magnitude)	Decimal Equivalent
00000000	+0
00000001	+1
00000010	+2
00000011	+3
00000100	+4
...	...
01111110	+126
01111111	+127
10000000	-0
10000001	-1
10000010	-2
10000011	-3
10000100	-4
...	...
11111110	-126
11111111	-127

Table 1: Range of 8-bit Signed Magnitude Numbers

EXERCISES

- **Exercise 1:** In the empty table below, trace the execution of the following SCA program:

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Address	Label	Command	Operand 1	Operand 2
0x00	start:	load	A	x
0x01		jumpifzero	end	
0x02		subi	A	1
0x03		store	A	x
0x04		jump	start	
0x05	end:	write		
0x06		halt		
0x07	x:	dv	2	

- **Exercise 2:** Translate the following high-level code into the SCA's assembly language and convert it to machine code, in the table below.

```
read x;
read y;
if ( x == y )
   y = x % 10;
x = y + 10;
print (x);
```

- **Exercise 3:** Translate the following high-level code into the SCA's assembly language and convert it to machine code, in the table below.

```
set sum = 0;
set x = 1;
read num;
while ( num != 0 ){
    sum = sum + num + 2 * x;
    num = num - 1;
}
print (sum);
```

Step	PC	A	[x]
0	0	0	2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

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Address	Label	Command	Operand 1	Operand 2	Machine Code
0x00					
0x01					
0x02					
0x03					
0x04					
0x05					
0x06					
0x07					
0x08					
0x09					
0x0A					
0x0B					
0x0C					
0x0D					
0x0E					
0x0F					
0x10					
0x11					
0x12					
0x13					
0x14					
0x15					
0x16					
0x17					
0x18					
0x19					
0x1A					
0x1B					
0x1C					
0x1D					
0x1E					
0x1F					

Address	Label	Command	Operand 1	Operand 2	Machine Code
0x00					
0x01					
0x02					
0x03					
0x04					
0x05					
0x06					
0x07					
0x08					
0x09					
0x0A					
0x0B					
0x0C					
0x0D					
0x0E					
0x0F					
0x10					
0x11					
0x12					
0x13					
0x14					
0x15					
0x16					
0x17					
0x18					
0x19					
0x1A					
0x1B					
0x1C					
0x1D					

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