

# CS1356 Introduction to Information Engineering

## Homework 5

1. Suppose the memory cells at addresses 00 through 05 in the machine described in Appendix C contain the following bit patterns:

Address	Contents
00	10
01	04
02	30
03	45
04	C0
05	00

When answering the following questions, assume that the machine starts with its program counter =00.

- Translate the instructions that are executed into English.
  - What bit pattern is in the memory cell at address 45 when the machine halts?
  - What bit pattern is in the program counter when the machine halts?
2. Suppose the memory cells at addresses 00 through 09 in the machine described in Appendix C contain the following bit patterns:

Address	content
00	1A
01	02
02	2B
03	02
04	9C
05	AB
06	3C
07	00
08	C0
09	00

Assume that the machine starts with its program counter containing 00.

- What will be in the memory cell at address 00 when the machine halts?
  - What bit pattern will be in the program counter when the machine halts?
3. Suppose the memory cells at addresses 00 through 07 in the machine described in Appendix C contain the following bit patterns:

Address	Contents
00	1A
01	06
02	3A
03	07
04	C0
05	00
06	23
07	00

- List the addresses of the memory cells that contain the program that will be executed if we start the machine with its program counter containing 00.
- List the addresses of the memory cells that are used to hold data.

4. In each of the following cases, write a short program in the machine language described in Appendix C to perform the requested activities. Assume that each of your programs is placed in memory starting at address 00.
  - a. Move the value at memory location 8D to memory location B3.
  - b. Interchange the values stored at memory locations 8D and B3.
  - c. If the value stored in memory location 45 is 00, then place the value CC in memory location 88; otherwise, put the value DD in memory location 88.
  
5. Write a program in the machine language of Appendix C to compute the sum of the two's complement values stored at memory locations A1, A2, A3, and A4. Your program should store the total at memory location A5.
  
6. Perform the indicated operations

a.	111000	b.	000100
	<u>AND 101001</u>		<u>AND 101010</u>
c.	000100	d.	111011
	<u>AND 010101</u>		<u>AND 110101</u>
e.	111000	f.	000100
	<u>OR 101001</u>		<u>OR 101010</u>
g.	000100	h.	111011
	<u>OR 010101</u>		<u>OR 110101</u>
i.	111000	j.	000100
	<u>XOR 101001</u>		<u>XOR 101010</u>
k.	000100	l.	111011
	<u>XOR 010101</u>		<u>XOR 110101</u>

7. Identify both the mask and the logical operation needed to accomplish each of the following objectives:
  - a. Put 0s in the middle four bits of an eight-bit pattern without disturbing the other bits.
  - b. Complement a pattern of eight-bits.
  - c. Complement the most significant bit of an eight-bit pattern without changing the other bits.
  - d. Put a 1 in the most significant bit of an eight-bit pattern without disturbing the other bits.
  - e. Put 1s in all but the most significant bit of an eight-bit pattern without disturbing the most significant bit.