

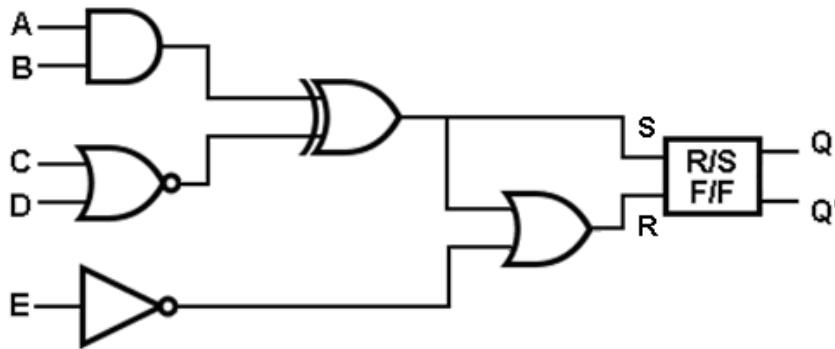
## Introduction to Computer Engineering Assignment 1

To be submitted (PRINTED-HARDCOPY) before 12:30 AM on Wed, 2<sup>nd</sup> of November, 2011

- 1) Convert your university registration number into binary (base-2), quinary (base-5), octal (base-8), then into hexadecimal (base-16) notation (show your work).
- 2) Write down your last name using ASCII code using eight bits per symbol (show your work).
- 3) In your own words, what's meant by:
 

1. Algorithm.	2. Abstraction.	3. Flip-Flop.	4. Hard-disk access time.
5. Most Significant Bit.	6. Byte.	7. Memory Location Address.	
8. Cache Memory.	9. Machine Instruction.	10. Registers.	11. Instruction Set.
12. CISC.	13. Op-Code.	14. Data Transfer Instruction.	
15. Fetch	16. Port	17. Serial Transfer	18. Pipelining
- 4) In no more than 3 lines each, explain how image data is stored in:
 

a. Bitmap image format.	b. GIF.	c. JPEG format.
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- 5) Write the full truth table for the following Boolean circuit:



- 6) Convert each of the following binary representations into its equivalent base ten form:
 

a. 11111101	b. 11010100	c. 01010010
d. 10010010	e. 10001101	f. 10101011
- 7) Convert each of the following base ten representations into its equivalent binary form:
 

a. 55	b. 555	c. 255	d. 256	e. 1023
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- 8) Express the following values in binary notation:
 

a. 5/16	b. 1 1/8	c. 5.625	d. 2 3/4	e. 0.03125
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- 9) Perform each of the following operations in binary notation
 

a. $10111$	b. $1010.001$	c. $11111$	d. $101.101$
$\div 1101$	$- 1.101$	$+0001$	$\times 00.010$
- 10) Represent each of the following numbers in floating point notation using 8 bits (as described in section 1.7), which one of them can not be represented accurately using that notation?
 

a. $6 \frac{1}{2}$	b. 9	c. $13/16$	d. $17/32$	e. $7 \frac{1}{2}$	f. $-3 \frac{1}{2}$	g. $1/10$	h. $-2 \frac{3}{8}$
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- 11) a. Write the number 321 by representing the 3, the 2, and the 1 in ASCII  
 b. Write the number 321 in binary representation.
- 12) Decode each of the following floating point bit patterns into decimal (suppose we used the notation described in section 1.7):
 

a. 10011001	b. 01101111	c. 10101100	d. 00011000	e. 01101001	f. 11011010
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- 13) What is the ASCII code for the following characters when adjusted for even parity?
 

a. 5	b. G	c. \$	d. >	e. ?	f. z
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- 14) Suppose the memory cells at addresses 00 through 05 in the machine that its instruction set is described in the language description table, contain the following bit pattern:

Address	Contents
00	21
01	04

02	31
03	00
04	C0
05	00

Assuming that the program counter initially contained 00, record the contents of program counter, instruction register, and memory cell at address 00, at the end of each fetch phase of the machine cycle until the machine halts.

- 15) The following are instructions written in the machine language described in the textbook, translate them into English:  
 a. 407E      b. 8008      c. A403      d. 2835      e. B3AD      f. 153B      g. B038

- 16) Suppose the following memory cells are as follow:

Address	Contents
AF	B0
B0	B0
B1	AF

What would happen if we started the machine with its PC (program counter) equal to AF?

- 17) The following is a routine encoded in the machine language described in the language description table. Explain (in a single sentence) what the routine does. (Explain what the entire routine does as a unit rather than reciting what each instruction does.)

210F  
 12A0  
 8212  
 32A0

- 18) Encode each of the following commands in terms of the machine language described in the language description table.

- A. \_\_\_\_\_ ROTATE the contents of register 6 to the right 4 bit positions.  
 B. \_\_\_\_\_ JUMP to the instruction at address B1 if the content of register 1 equals that of register 0.  
 C. \_\_\_\_\_ ADD the contents of registers 4 and 5 as though they were values in floating-point notation and leave the result in register 3.  
 D. \_\_\_\_\_ AND the contents of registers 4 and 5, leaving the result in register 3.

- 19) Write a program in the language described in the text that tries to avoid any attacks from the opposing program by moving to different locations. More precisely, write your program to start at location 00, copy itself to location 70, and then jump to this new copy.

*Good Luck*  
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