

一、单项选择题（本大题共 10 小题，每小题 2 分，共 20 分）

提示：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码填写在括号中。错选、多选或未选均无分。

1. Which even-parity code is in error?
 - (A) 11000110
 - (B) 00101000
 - (C) 10101010
 - (D) 11111011
2. The number 1010 in BCD is
 - (A) equal to decimal eight
 - (B) equal to decimal ten
 - (C) equal to decimal twelve
 - (D) invalid
3. The binary number 11011101 is equal to the decimal number
 - (A) 121
 - (B) 221
 - (C) 441
 - (D) 256
4. The sum of 1111 + 1111 in binary equals
 - (A) 0000
 - (B) 2222
 - (C) 11110
 - (D) 11111
5. The BCD number for decimal 473 is

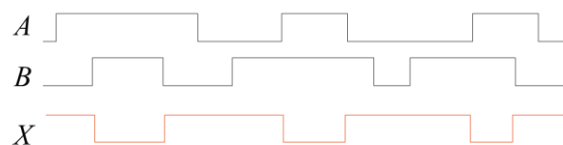
- (A) 111011010
- (B) 110001110011
- (C) 010001110011
- (D) 010011110011

6. The binary number 101100111001010100001 can be written in octal as

- (A) 5471230
- (B) 5471241
- (C) 2634521
- (D) 23162501

7. A 2-input gate produces the output shown. (X represents the output.) This is a(n)

- (A) OR gate
- (B) AND gate
- (C) NOR gate
- (D) NAND gate



8. The expression $A'BCD + ABCD' + AB'C'D$

- (A) cannot be simplified
- (B) can be simplified to $A'BC + AB'$
- (C) can be simplified to $ABCD' + A'BC'$
- (D) None of these answers is correct

9. An exclusive-NOR(XNOR) function is expressed as

- (A) $A'B' + AB$

(B) $A'B + AB'$

(C) $(A' + B)(A + B')$

(D) $(A' + B')(A + B)$

10. A flip-flop is SET when

(A) $J = 0, K = 0$

(B) $J = 0, K = 1$

(C) $J = 1, K = 0$

(D) $J = 1, K = 1$

二、填空题（本大题共 9 空，每空 2 分，共 18 分）。

1. (18pts) Complete the following table of equivalent values. Use binary numbers with a sign bit and 7 bits for the value.

Decimal	Signed Magnitude	2's Complement code	1's Complement code
		01111010	
-64			
	10011001		

三、分析计算题（本大题共 6 小题，共 42 分）。

1. (共 5 分) Reduce the following using the Boolean algebra rules and draw the logic diagram using only NAND gates:

$$F = AB + \overline{C} + A\overline{C} + B$$

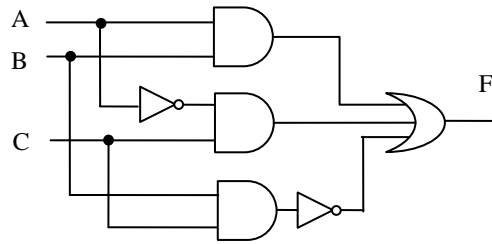
2. (共 6 分) Implement the basic logic gates (AND, OR, NOT) only by the NAND gates respectively.
3. (共 15 分) Simplify the following expressions using Karnaugh maps.

$$A = f(A, B, C, D) = \sum m(0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 13).$$

$$B = f(w, x, y, z) = \sum (0, 3, 4, 7, 8) + \sum d(10, 11, 12, 13, 14, 15)$$

$$C = f(a, b, c, d) = \prod (0, 4, 5, 7, 8, 9, 11, 12, 13)$$

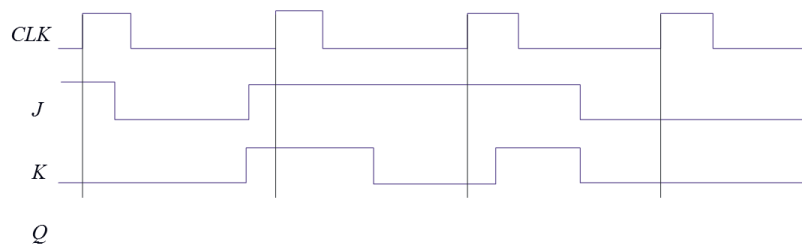
4. (共 6 分) Write the switching expressions for the following logic circuits and Simplify it.



5. (共 5 分) Realize the function shown below using a 3-to-8 decoder and the appropriate logic gates.

$$f(a,b,c) = (a+b'+c)(a'+b)$$

6. (共 5 分) Determine the Q output for the J - K flip-flop, given the inputs shown. Notice that the outputs change on the leading edge of the clock..



四、设计题（本大题共 2 小题，共 20 分）。

1. (共 8 分) Design a magnitude comparator circuit for 2-bit binary numbers $A=A_1A_0$ and $B=B_1B_0$. The outputs are F, G, and H, where F is true if $A>B$, G is true if $A=B$, and H is true if $A<B$.
2. (共 12 分) Complete the design for the state machine described in the state diagram below.
 - a) Write out the state table.
 - b) Assign states using a simple binary order (ex. $S_0 = ABC = 000$) and write out the transition table.
 - c) Write out the flip-flop input excitation table assuming JK flip-flops are used.
 - d) Sketch the circuit diagram.

