中山大学软件学院 **2008** 级软件工程专业(2009 秋季学期)

《数字电路与逻辑设计》 期末试题试卷(A)

(考试形式：闭卷　　考试时间：2 小时)

警示

《中山大学授予学士学位工作细则》第六条

考试作弊不授予学士学位

方向：_____　　姓名：_____　　学号：_____

Part I　Fill in the blanks　（15 points）

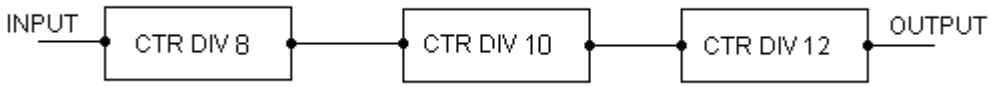
1. (3 points) Number conversion:

（8C）$_{16}$ ＝（　　）$_2$　　（10011101）$_2$＝（　　）$_{16}$

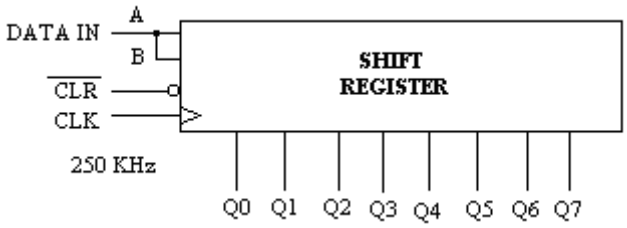
（127）$_{10}$＝（　　）$_2$

2. (3 points) According to the rules of Boolean algebra, $A+\overline{A}=$(　　).

3. (3 points) The overall modulus for the counter shown here is (　　).



4. (3 points) An 8-bit serial in/serial out shift register is shown here. Determine the amount of time delay between the output Q_0 and output Q_3. (　　) μs



5. (3 points) Determine the output state for a multiplexer with the input states shown. $D_0 = 1$, $D_1 = 0$, $D_2 = 0$, $D_3 = 0$, $S_0 = 1$, $S_1 = 1$, Y= (　　).

Part Ⅱ Choose the best answer (15 points)

1．(3 points) According to DeMorgen theorems, the following equality(s) is (are) correct:

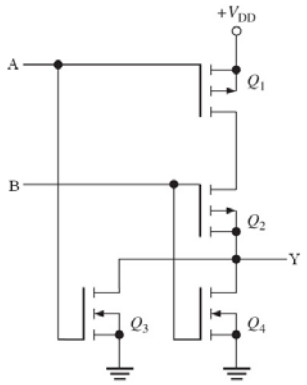
(a) $\overline{AB}=\overline{A}\cdot\overline{B}$　　(b) $\overline{XYZ}=\overline{X}+\overline{Y}+\overline{Z}$

(c) $\overline{A+B+C}=\overline{A}+\overline{B}+\overline{C}$　　(d)　all of these

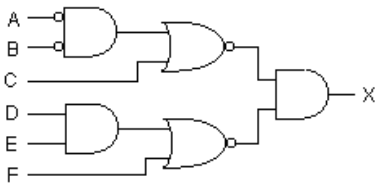
2. (3 points) The following circuit is a

(a) NAND gate (b) AND gate

(c) OR gate (d) NOR gate



3. (3 points) Choose the output expression for this circuit.



(a) $X = (\overline{A}\,\overline{B} + C)(D\,E + F)$ (b) $X = \overline{(\overline{A}\,\overline{B} + C)}(D\,E + F)$

(c) $X = (A\,B + C)(D\,E + F)$ (d) $X = \overline{(\overline{A}\,\overline{B} + C)}\,\overline{(D\,E + F)}$

4. (3 points) Two 4-bit binary numbers (1011 and 1111) are applied to a 4-bit parallel adder. The carry input is 1. What are the values for the sum and carry output?

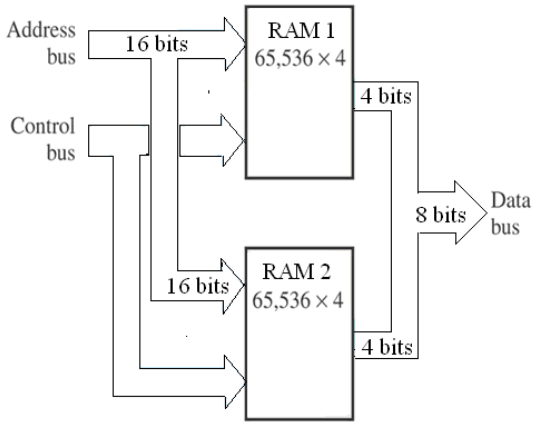
(a) $\Sigma_4\Sigma_3\Sigma_2\Sigma_1 = 0111$, $C_{out} = 0$ (b) $\Sigma_4\Sigma_3\Sigma_2\Sigma_1 = 1111$, $C_{out} = 1$

(c) $\Sigma_4\Sigma_3\Sigma_2\Sigma_1 = 1011$, $C_{out} = 1$ (d) $\Sigma_4\Sigma_3\Sigma_2\Sigma_1 = 1100$, $C_{out} = 1$

5．(3 points) Using two ICs as shown will expand

(a) the word size (b) the number of words available

(c) both of the above (d) none of the above



Part Ⅲ Circuit analysis and design (70 points)

1．(12 points) Simplify each expression to a minimum SOP form:

(a) $Y = \overline{A}B + A\overline{C} + C\ D + \overline{D}$

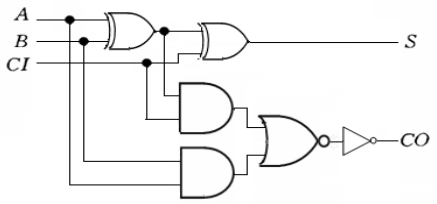
(b) $Y = A\overline{C} + ABC + AC\overline{D} + CD$

2．(10 points) For the following circuit:

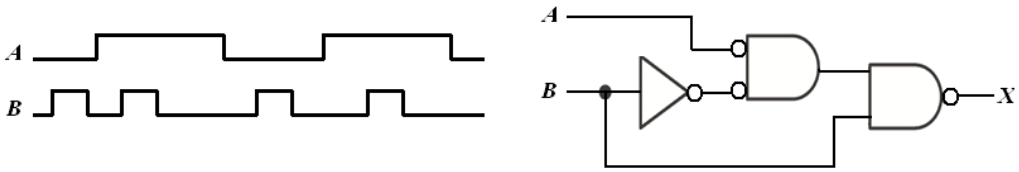
(a). find an algebraic expression（in any form）.

(b). form the truth table of the circuit.

(c). describe its function.



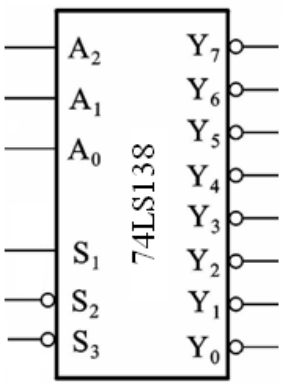
3．(8 points) For the following circuit, draw the output waveform in proper relationship to the inputs.



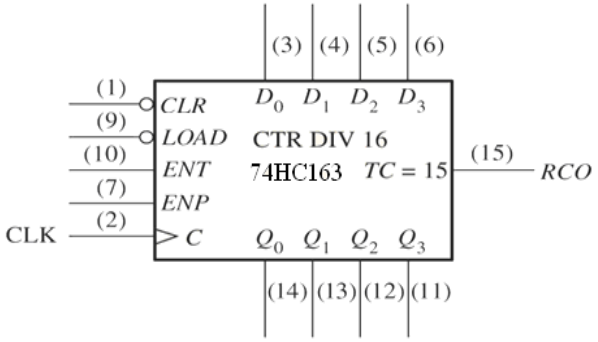
4. (10 points) Implement the following functions by using one decoder (74LS138) and two gates (one NAND gate and one AND gate). Show a block diagram.

$F_1 = \sum m(4, 5, 6)$

$F_2 = \sum m(0, 1, 3, 4, 5, 7)$

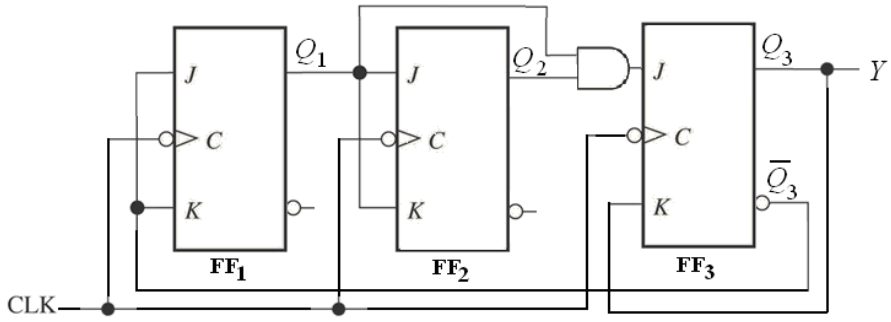


5．(10 points) Using a 74HC163 4-bit binary counter, design a modulo-12 counter with the counting sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 1, 2, 3, 4, …



CLK	$\overline{CLR}$	$\overline{LOAD}$	ENT	ENP	Operating mode
↑	0	X	X	X	Reset
↑	1	0	X	X	Parallel load
↑	1	1	1	1	Count
↑	1	1	X	0	Hold
↑	1	1	0	X	Hold

6. (10 points) For the following circuit, find the equations (J, K, Q^{n+1}) and draw timing diagram showing the Q output of each flip-flop.



7. (10 points) Develop a synchronous modulus-7 counter. Use J-K flip-flops.