Introduction to Digital Computing

Homework 7: Boolean algebra, DeMorgan's Theorem, Karnaugh Map, and data control circuits

Student's Name_____

Instruction:

- Show all work to receive full credit. Box or circle the answer

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Question 1

Use Boolean algebra to simplify the following expression $AB\overline{C} + \overline{A}BC + B\overline{C}$

Sketch the simplified circuit

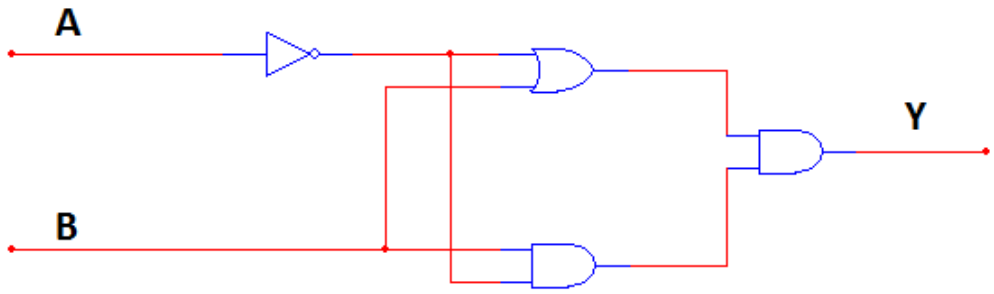
Question 2

Simplify the following expression using Boolean algebra and DeMorgan's theorem

$\overline{(\overline{A}B) + \overline{B}C}$

Question 3

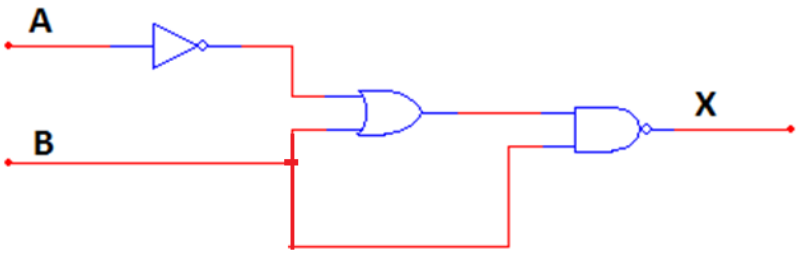
Find and simplify the output Y of the following logic circuit using Boolean algebra



Draw the simplified circuit

Question 4

Simplify the output X of the following logic circuit using Boolean algebra and DeMorgan's theorem



Question 5

Simplify the following Karnaugh Map to its most simplified form:

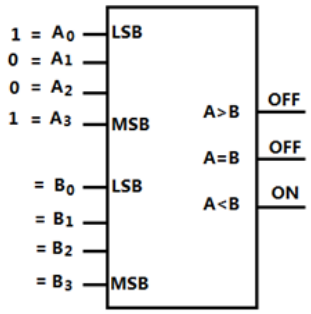
	$\bar{C}\bar{D}$	$C\bar{D}$	CD	$\bar{C}D$
$\bar{A}\bar{B}$	1	1	0	1
$\bar{A}$B	0	0	1	1
AB	0	0	1	0
A$\bar{B}$	1	1	1	1

Question 6

Simplify the following SOP output X = $\bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}C + ABC$ using K-map

	$\bar{C}$	C
$\bar{A}\bar{B}$		
$\bar{A}$B		
AB		
A$\bar{B}$		

Question 7

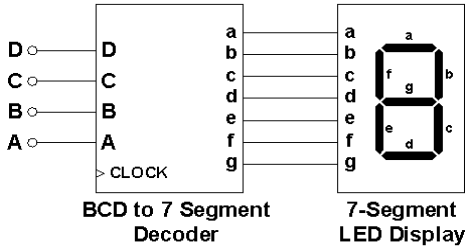


For the following inequality comparator, list all possible inputs for B

Question 8

Design a logic circuit to decode the binary string A=0010_2. Assuming that A_0 is the LSB and A_3 is the MSB, write the output equation with respect decoder

Question 9

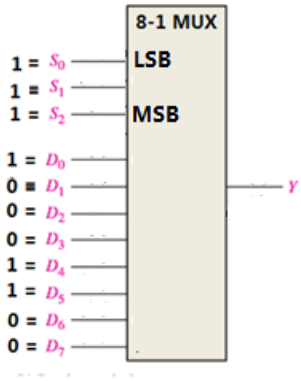


For the following BCD to 7-segment decoder circuit, if we assume that D is the least-Significant-Bit (LSB) and A the Most Significant Bit (MSB)

If we receive the following input, which segment of the 7-segment will be ON? A = 0, B = 0, C = 1, D = 1

Segment that will be ON? Write the segment in alphabetic order _____

Question 10

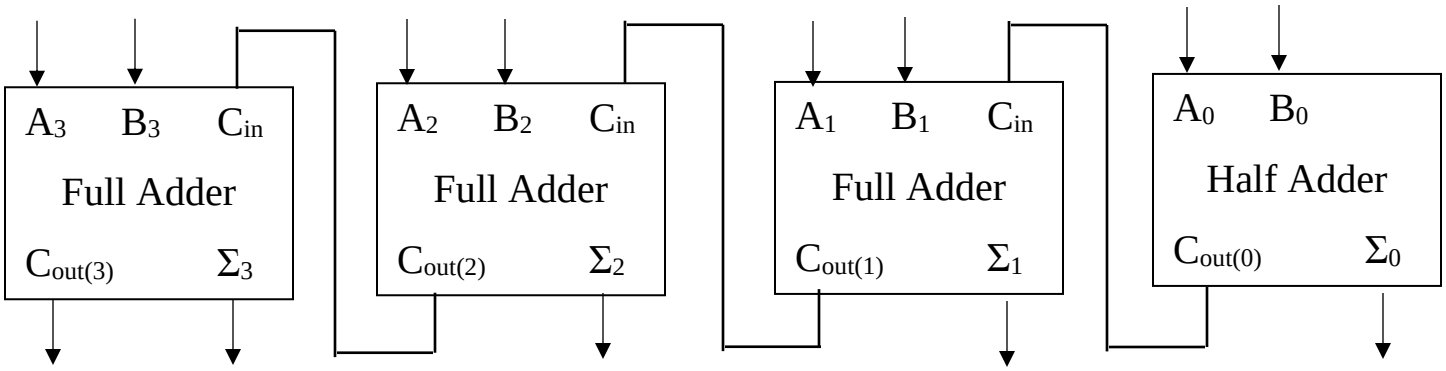


For the following 8-1 MUX, which Data Input is selecting the data selector?_____

What would be output Y?_____

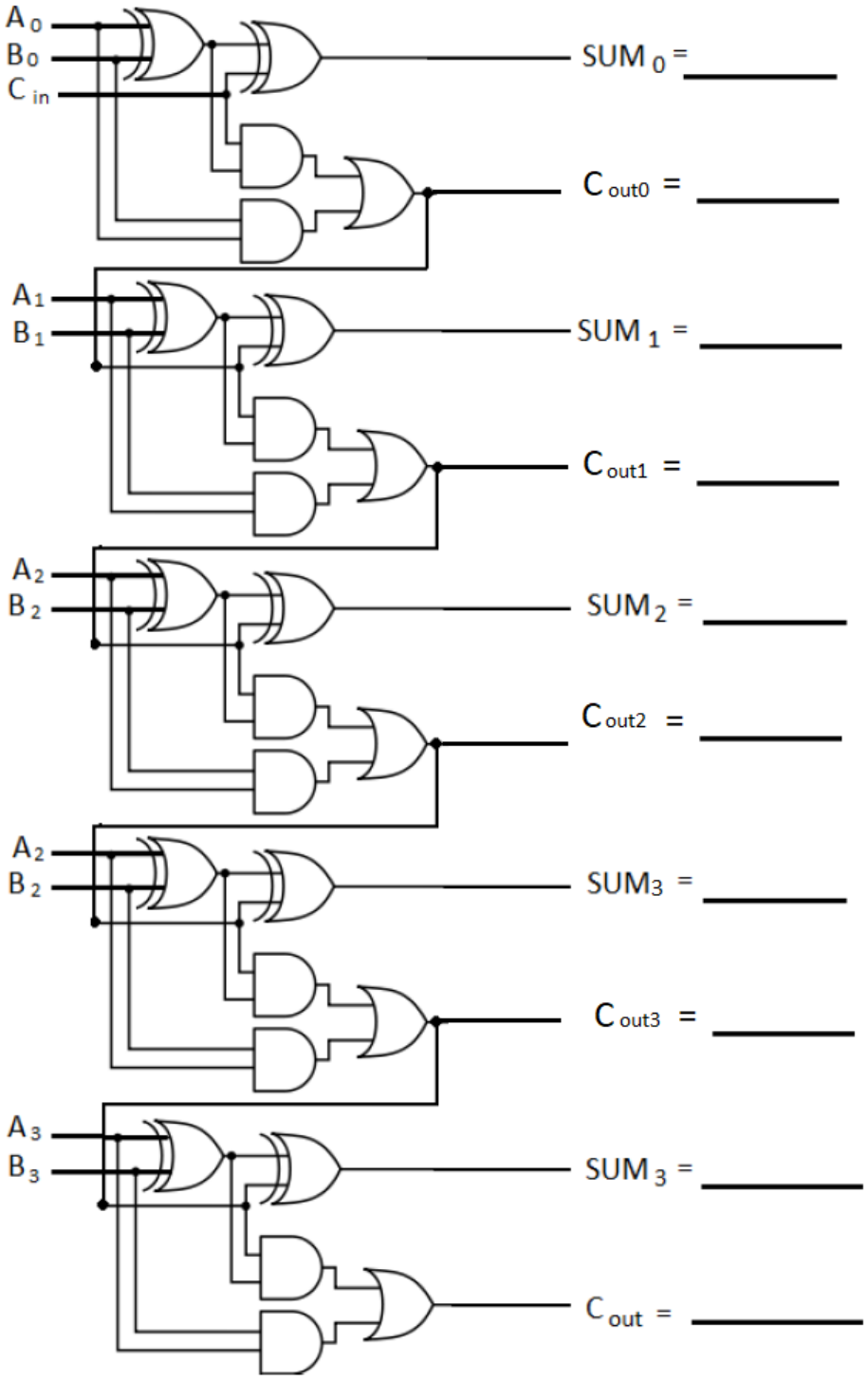
Question 11

Having the following input A = 1010_2 and B = 0011_2 through the 4-bit full adder below, what would be the output for $\Sigma_3, \Sigma_2, \Sigma_1, \Sigma_0$, and $C_{out(3)}$



Question 12
For the following 4-bit full-adder circuit, show the bit flow and find SUM0, SUM1, SUM2, SUM3, and Cin, given:

$A = 0111_2$
$B = 1101_2$
$C_{in} = 0$



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