

Name:

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Grade:

3) [20] Consider the following two functions:

$$X = \bar{A}BCD + \bar{A}B\bar{C}D + A\bar{B}\bar{C}D + BCD$$

$$Y = A\bar{B}CD + AB\bar{C} + ACD + ABD$$

3.a) [2] Expand the above functions to sum of Minterm using K-maps:

X CD

AB	00	01	11	10
00				
01		1	1	
11			1	
10		1		

Y CD

AB	00	01	11	10
00				
01				
11	1	1	1	
10			1	

	00	01	11	10
00				
01				
11				
10				

	00	01	11	10
00				
01				
11				
10				

$$X = f(A, B, C, D) = \bar{A}BD + BCD \quad [5, 7, 9, 15]$$

$$Y = f(A, B, C, D) = A\bar{B}\bar{C} + ACD \quad [11, 12, 13, 15]$$

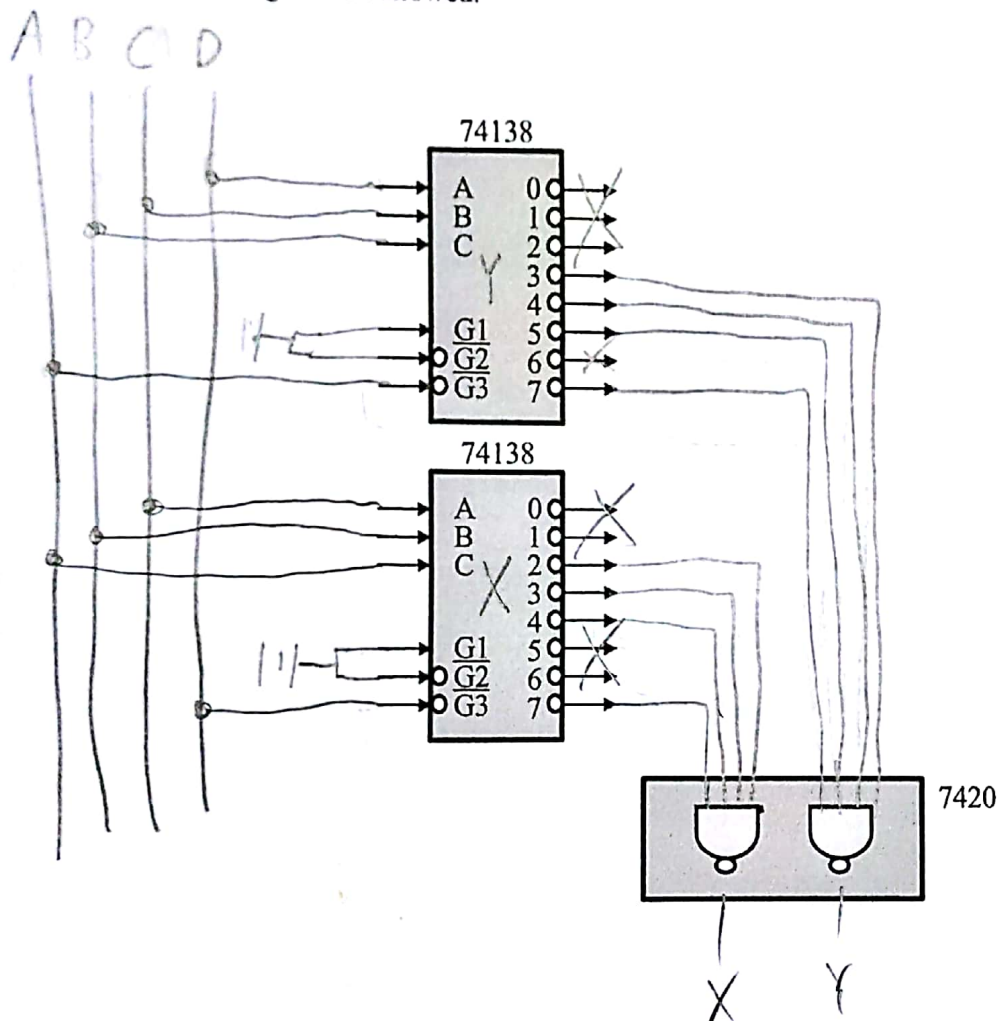
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- 3.b) [4] Show the input connections necessary to realize the above Boolean expressions using exactly two 3-to-8 Decoders, (2 of 74138 chips) and two 4-input NAND gates (7420 chip). No other gates are allowed.



- 3.c) [10] Build the above circuit using the specified logic chips on your breadboard and then connect it to the test platform to test it. Use 4 logic switches as inputs and 2 LEDs as outputs. You need to test all the 16 different input combinations of the inputs
- 3.d) [4] You can verify the circuit design/behavior by implementing the circuit using Quartus. You may wish to do this before you actually build the circuit on the breadboard.