

Quiz #3

1. Simplify the following Boolean functions F , together with the don't care conditions d , and then express the simplified function in sum-of-minterms form: (20 points)

$$F(A, B, C, D) = \Sigma(0, 1, 5, 7, 9)$$

$$d(A, B, C, D) = \Sigma(2, 3, 4, 6, 8, 10, 12, 14)$$

$$\text{Solution} = A' + B'C'$$

AB \ CD	CD			
	00	01	11	10
00	1	1	×	×
01	×	1	1	×
11	×			×
10	×	1		×

2. With the use of K-map, find the simplest sum-of-products form of the function $F = f + g$, where $f = a'd' + bd$, $g = (a' + d)(b' + c')(b + c + d)$ (20 points)

$$f =$$

ab \ cd	cd			
	00	01	11	10
00	1	0	0	1
01	1	1	1	1
11	0	1	1	0
10	0	0	0	0

$g =$

		cd			
		00	01	11	10
ab	00	0	1	1	1
	01	0	1	0	0
	11	0	1	0	0
	10	0	1	1	0

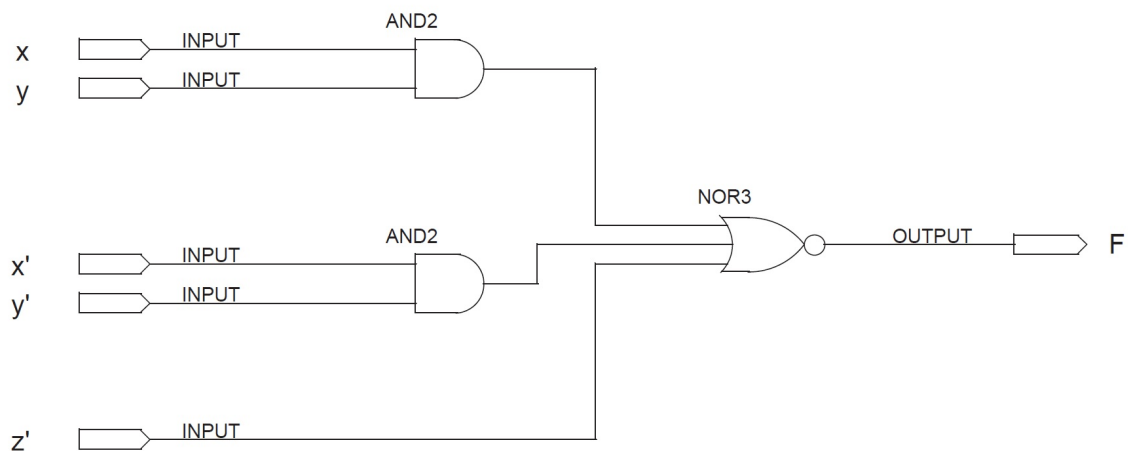
$F =$

		cd			
		00	01	11	10
ab	00	1	1	1	1
	01	1	1	1	1
	11		1	1	
	10		1	1	

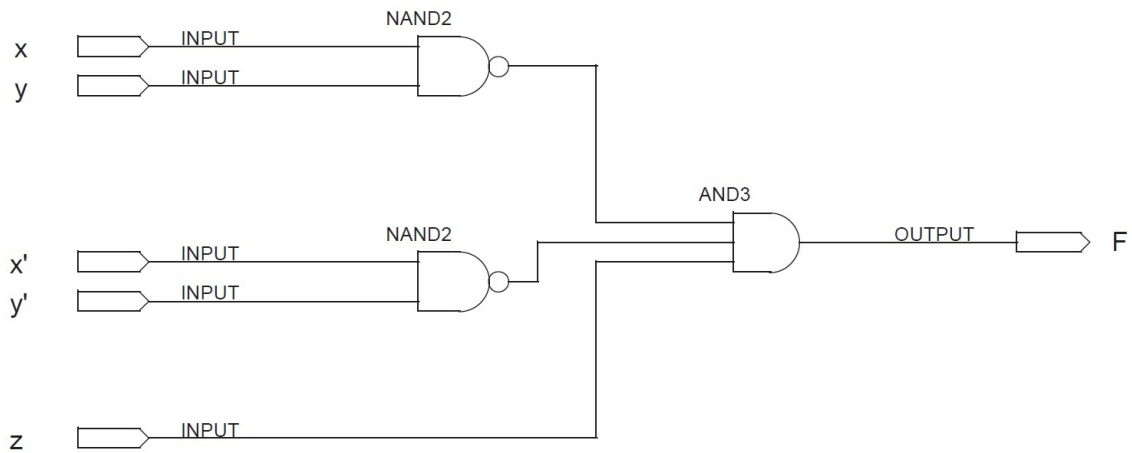
Solution = $a' + d$

3. Implement the function, $F(x, y, z) = xy'z + x'yz$

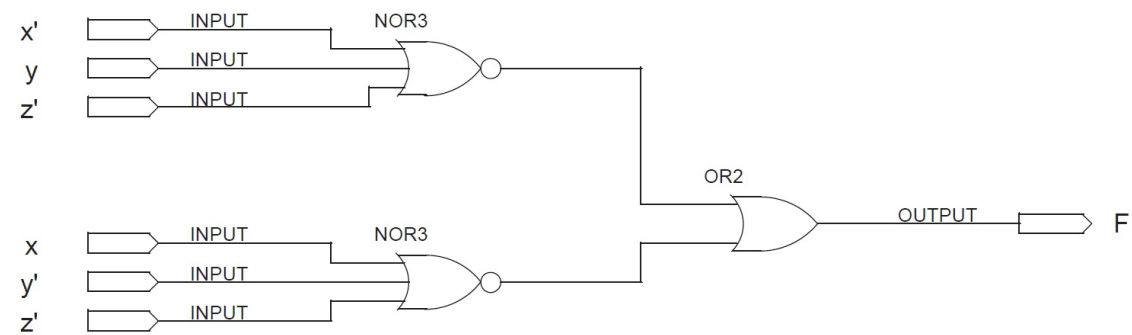
(a) a minimum two-level AND-NOR circuit (10 points)



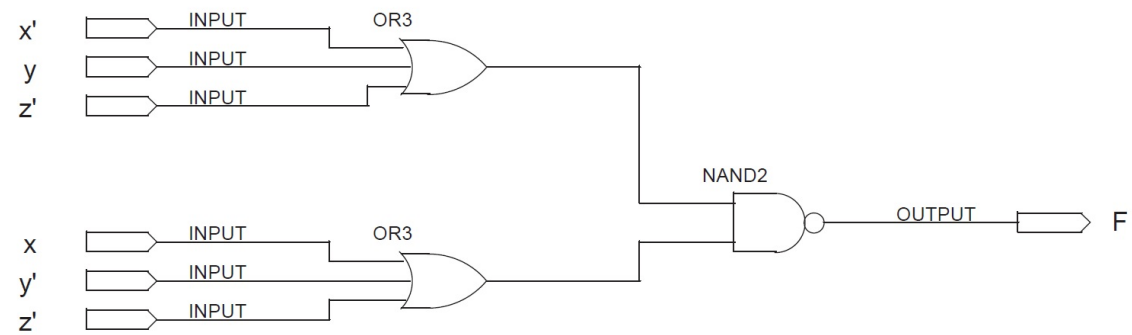
(b) a minimum two-level NAND-AND circuit (10 points)



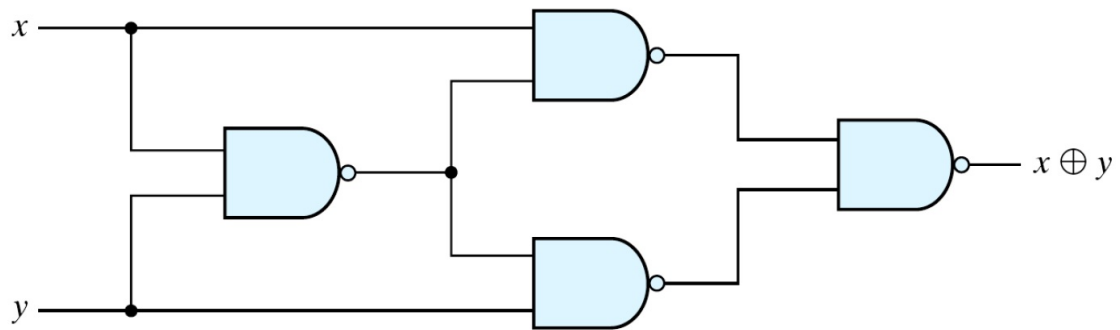
(c) a minimum two-level NOR-OR circuit (10 points)



(d) a minimum two-level OR-NAND circuit (10 points)



4. For the following expression: $F = x \oplus y$, implement F with multi-level “NAND gates” (20 points)



With NAND gates

