

0907231 Digital Logic	First Exam	Spring 2015
6 Problems, 4 Pages	70 Minutes	March 17, 12:50 PM
الشعبة:	الرقم الجامعي:	الاسم:

Problem 1. Solve the following short problems. (5 points)

a) $(213)_4$ is equal to $(\quad)_2$

b) $(C.9)_{16}$ is equal to $(\quad)_8$

c) If $F(x, y, z) = \sum_m(0,2)$, then the Boolean expression of \bar{F} as a product of maxterms is: _____.

Problem 2. Using Boolean algebra only, prove that:

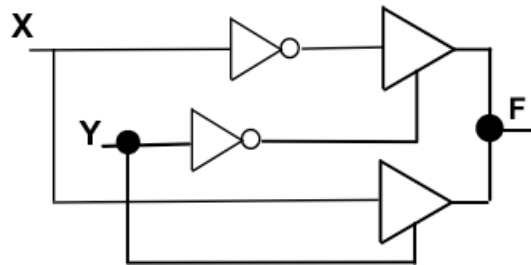
$$\bar{x} + xy + x\bar{z} + x\bar{y}\bar{z} = \bar{x} + y + \bar{z} \quad (2 \text{ points})$$

(Note: specify the name of any algebraic theorem when used)

Problem 3. Assume designing a display system for a weight scale. The minimum weight is 0 kilos and the maximum weight is 140 kilos and weights can only be integers (the weight range is 0, 1, 2, ..., 140). (5 points)

- a) What is the minimum number of digits required to represent the weight in binary?
- b) What is the minimum number of digits required to represent the weight in octal?
- c) What is the minimum number of digits required to represent the weight in BCD?
- d) What is the minimum radix of a number system that can represent the weight in two digits only?

Problem 4: Write the Boolean expression for F. (2 points)



F(X,Y) =

Problem 6. Consider the following k-map for the function $F(A, B, C, D)$.

		C			
		┌───┐			
		1	0	0	1
		1	1	1	1
		0	1	1	0
		1	0	0	1
		└───┘			
		D			
A	┌───┐				
					B
					└───┘

(6 points)

- a) Specify the Boolean expressions of all prime implicants.

- b) Specify the Boolean expressions of all essential prime implicants.

- c) Write the Boolean expression of \bar{F} as an optimized Sum of Products (SoP).