Ve270 Introduction to Logic Design

Homework 1

Assigned: May 18, 2017

Due: May 25, 2017, at the beginning of the class.

The homework should be submitted in hard copies.

1. Fill out the blank spaces. Show steps to earn partial credits. (10 points)

    $1101101.011_2 = $ _____$_{10} = $ _____$_{16}$

    $87.64_{10} = $ _____$_2 = $ _____$_8 = $ _____$_3$

2. Do the following arithmetic operations <u>step by step</u>: (15 points)

    $(6FE58C + 3ADD)_{16} = $

    $(11100 - 10001111)_2 = $

    $(545 - 267)_8 = $

3. Problem 2.13 (Boolean equation = logic equation) (4 points)

2.13 Evaluate the Boolean equation F = a AND (b OR c) AND d for the given values of variables a, b, c, and d:
   (a) a=1, b=1, c=0, d=1
   (b) a=0, b=0, c=0, d=1
   (c) a=1, b=0, c=0, d=0
   (d) a=1, b=0, c=1, d=1

4. Problem 2.15 (10 points)

2.15 Show the conduction paths and output value of the OR gate transistor circuit in Figure 2.12 when: (a) x = 1 and y = 0, (b) x = 1 and y = 1.
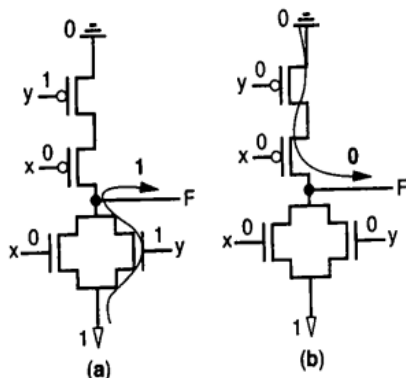

Figure 2.12 OR gate conduction paths: (a)when one input is 1, and (b) when both inputs are 0.

5. Problem 2.18 (c) (10 points)

2.18 Convert each of the following equations directly to gate-level circuits:
(a) F = a'b' + b'c
(b) F = ab + bc + cd + de
(c) F = ((ab)' + (c)) + (d + ef)'

6. Problem 2.20 (15 points)

2.20 Design a system that sounds a buzzer inside a home whenever motion outside is detected at night. Assume a motion sensor has an output M that indicates whether motion is detected (M=1 means motion detected) and a light sensor with output L that indicates whether light is detected (L=1 means light is detected). The buzzer inside the home has a single input B that when 1 sounds the buzzer. Capture the desired system behavior using an equation, and then convert the equation to a circuit using AND, OR, and NOT gates.

7. Problem 2.33 (6 points)

2.33 Create a Boolean equation representation for the digital circuit in Figure 2.79.
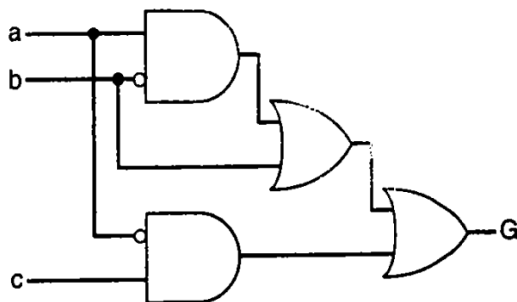

Figure 2.79 Combinational circuit for G.

8. Problem 2.35 (c) (d) (10 points)

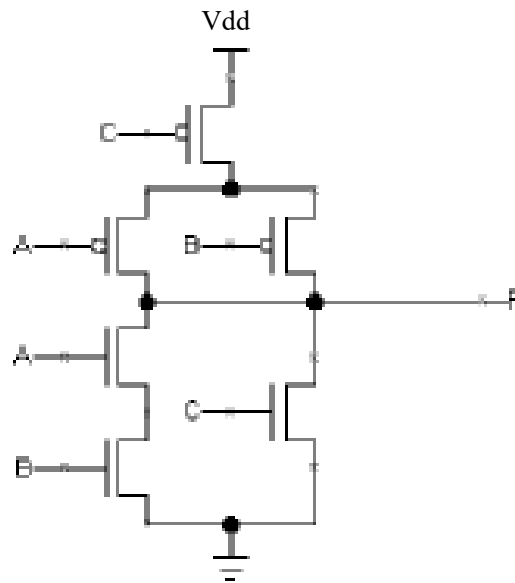2.35 Convert each of the following Boolean equations to a truth table:
(a) F(a,b,c) = a' + bc'
(b) F(a,b,c) = (ab)' + ac' + bc
(c) F(a,b,c) = ab + ac + ab'c' + c'
(d) F(a,b,c,d) = a'bc + d'

9. Build a truth table for the following circuit. (10 points)

10. Given a logic equation F = a'c' + b'c + ab, draw an output waveform for F based on the given input waveforms. (10 points)