VLSI Design, Fall 2017

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Homework No. 0

Assigned: August 30, 2017

Due: September 6, 2017

1. Minimize the following Boolean equations to eliminate redundancy:

$$ab + bdc + c\overline{a}$$

$$(x + y)(x + z)$$

$$a(b + c + d) + b(c + d + a) + c(d + a + b) + d(a + b + c)$$

2. Label the inputs of the circuit in Figure 1 so that it implements the function

$$d(b + \overline{b}c) + ab\overline{c} + \overline{a}bc$$

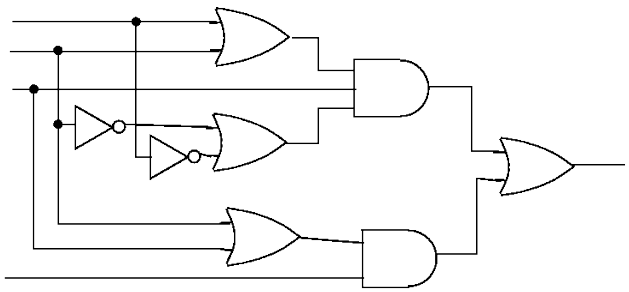

Figure 1: Circuit for Function

3. Identify the functions below which are equivalent to $\overline{x} \oplus y$

$$xy + \overline{x}\ \overline{y}$$

$$x \oplus y$$

$$x \oplus \overline{y}$$

$$\overline{(\overline{x} + \overline{y})(x + y)}$$

4. Draw the state transition diagram of a Finite-State-Machine with one input and one output, which produces an output of 1 when the input sequence has an even number of 0s and an odd number of 1s. (It is assumed that, in the starting state, the number of 0s and 1s is even.)

Shown on the right is a partially drawn state diagram, with the state producing the output of 1 represented as a double circle (the machine is said to "accept" the string and the state is called an "accepting state").

Complete the state diagram for the above specification.

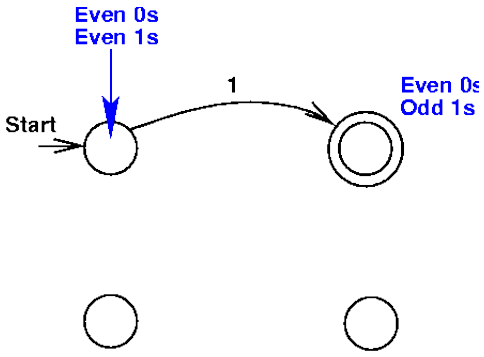

Figure 2: State Machine