Homework 4

CS51A Fall 2018 - Due date November 9

October 31, 2018

1. A combinational system has four inputs a, b, c, d and one output y which is 1 iff $8a + 4b + 2c + d$ is a prime. Find both SOP and POS formulas and identify which one will have minimal complexity. Design a minimal two-level network to implement this system.

2. Obtain minimal switching expressions for computing residue mod 7 of an integer in range 0 to 15.

3. Design a two-level NOR network that performs four-bit binary to gray code conversion. Minimize each output separately by K-MAP.

4. Design a complementer with only XOR gates which perform $z_i = x_i c_i' + x_i' c_i$ for $0 \leq i \leq 3$ where x_i's and c are network inputs and z_i's are network outputs.

5. A sequential system is described by the following expresssions, where the state is a bit-vector of four components (s_3, s_2, s_1, s_0):

$$s_0(t + 1) = s_3(t) \oplus x(t)$$

$$s_i(t + 1) = s_{i-1}(t) \quad \text{for } 1 \leq i \leq 3$$

$$z(t) = s_3(t)$$

6. A sequential system has an imput with values a, b, and c, and one binary output. The output at time t is 1 if $x(t - 3, t) = abca$ and the number of a's in $x(0, t)$ is even. Obtain a "loose" state desciption and minimize the number of states.