CprE 281 Recitation 04 Solutions

1) Problem 2.7: One can determine if the two sides are the same by constructing either K-maps or truth tables for both sides. One may also use Boolean algebra to manipulate the two sides to see if they can be made the same. But this approach is more difficult.
   Answer: (a) Yes (b) Yes (c) No

2) Problem 2.14: The simplest POS expression is: *f = (x1+x3+x4)(x1+x2'+x3)(x1+x2'+x4).*

3) Problem 2.67: Representing both functions in the form of Karnaugh map, it is easy to show that f = g. The min. cost SOP expression is f = g = x2.x4 + x1.x2'.x4' + x1'.x2.x3 + x2'.x3'.x4'.

4) Problem 2.68: Representing both functions in the form of Karnaugh map, it is easy to show that f and g do not represent the same function. In particular: f(1, 1, 0, 1, 0) = 1 while g(1, 1, 0, 1, 0) = 0 and f(1, 1, 1, 1, 1) = 0 while g(1, 1, 1, 1, 1) = 1.

5) Implementing the circuit as
   f = x2'.x3.x4' + x1.x2.x3.x4 + x2'.x3'
   g = x2'.x3.x4' + x1.x2.x3.x4 + x1.x3'.x4 + x1'.x3.x4
   Note that the first two product terms are shared by f and g. Assuming complemented inputs are given. There are 7 gates and 22 inputs for a cost of 29.

6) Implement first the complement of f as
   f' = x1.x3 + x2.x4 = (x1 ↑ x3) ↑ (x2 ↑ x4)
   Then f = f' ↑ f'.