Module 3 :: Switching Algebra and Properties

Practice Problems

1. Simplify the following switching expressions using algebraic method:

   x' + y´ + x.y.z´

   (x´ + x.y.z´) + (x´ + x.y.z´).(x + x´.y´.z)

   a + a´.b + a´.b´.c + a´.b´.c´.d +...

   w´.x´+ x´.y´+ w´.z´+ y.z

   ((x + y´.z´).(y + x´.z´).(z + x´.y´))´

2. Determine the canonical sum-of-products expressions for the following functions:

   a) f(x,y,z) = z + ((x´ + y).(x + y´)

   b) f(x,y,z) = x + (x´.y´ + x´.z) ´

3. Determine which of the following are functionally complete / universal? Justify your answer.

   a) NAND

   b) NOR

   c) (EXOR, AND)

   d) 2-input Multiplexer

   e) The function f(A,B,C) = A'.B.C + A.B' + B'.C'

4. You are presented with a set of requirements under which an insurance policy will be issued. The applicant must be:

   A married female 25 years old or over, or

   A female under 25, or

   A married male under 25 who has not been involved in a car accident, or

   A married male who has been involved in a car accident, or

   A married male 25 years or over who has not been involved in a car accident.

   Define appropriate variables to capture the requirements.

   a) Find an algebraic expression that assumes the value 1 whenever the policy should be issued.

   b) Simplify algebraically the above expression and suggest a simpler set of requirements.