Comp3222

Tutorial 1

1. Use algebraic manipulation to prove that (x+y)*(x+y')=x

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factoring: ( x + y )( x + y' )= xy + xy'
uniting: xy+xy' = x
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2. Use the algebraic manipulation to prove that xy+yz+x'z = xz+x'z.

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Dual factoring: xy + x'z = (x+z)(x'+y)
distributivity: yz + x'z = (y+x')z
distributivity: xy+yz = (x+z)y
xy + x'z + yz = (x'+y)(x+z+z)+(x+z)y
iodempotency: x+z+z = x + z
xy + x'z + yz  = (x'+y)(x+z)+(x+z)y = (x'+y+y)(x+z) = (x'+y)(x+z)
factoring:  xy + x'z + yz = xy + x'z
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3. Determine whether or not the following expression is valid:

$$x_1 * \overline{x_3} + x_2 * x_3 + \overline{x_2} * \overline{x_3} = (x_1 + \overline{x_2} + x_3)(x_1 + x_2 + \overline{x_3})(\overline{x_1} + x_2 + \overline{x_3})$$

4. Draw a timing diagram for the circuit .Show the waveforms that can be observed on all wires in the circuit.

5.Use algebraic manipulation to show that for three input variables x_1, x_2 and x_3

$$\sum M(0,1,2,3,4,5,6) = x_1 x_2 x_3$$

6.Use algebraic manipulation to find the minimum product of sums expression for function

$f = (x_1 + x_2 + x_3)(x_1 + \overline{x_2} + x_3)(\overline{x_1} + \overline{x_2} + x_3)(x_1 + x_2 + \overline{x_3})$

7. Design the simplest circuit that has three inputs,x_1, x_2 , and $\$x_3$, which produces an output value of 1 whenever exactly one or two of the input variables have the value 1; otherwise the output has to be 0

8.For the timing diagram in figure,synthesize the function $f(x_1, x_2, x_3)$ in the simplest product-of-sums form.

9.For the timing diagram in figure, synthesize the function $f(x_1, x_2, x_3)$ in the simplest sum-of-products form

10.Write VHDL code to implement the function

$$f(x_1, x_2, x_3) = \sum m(0, 1, 3, 4, 5, 6)$$