Learning Material - Experiment in ICT 2

Week 3

Goal of week

Review 2 canonical forms

- Sum of product
- Product of sum

Review basic logic gates and their function (AND, OR, NOT, NAND, NOR)
Introduce Exclusive logic gates (XOR, NXOR)
Review properties of Boolean function

- Implication Equivalence
- Classification of variables
- Classification of functions
  - Unite function
  - Symmetric function
  - Decomposable function

Exercises

1. Show that if $m_1 + \ldots + m_n$ is the canonical SOP form of f(m1…m_n) then $\overline{m_1} \ldots \overline{m_n}$ is the canonical POS form of $\overline{f(m_1 \ldots m_n)}$
2. Find the canonical SOP form of f_1

x	y	f_1
0	0	1
0	1	1
1	0	0
1	1	1

3. Find the canonical SOP form of each of the following functions:

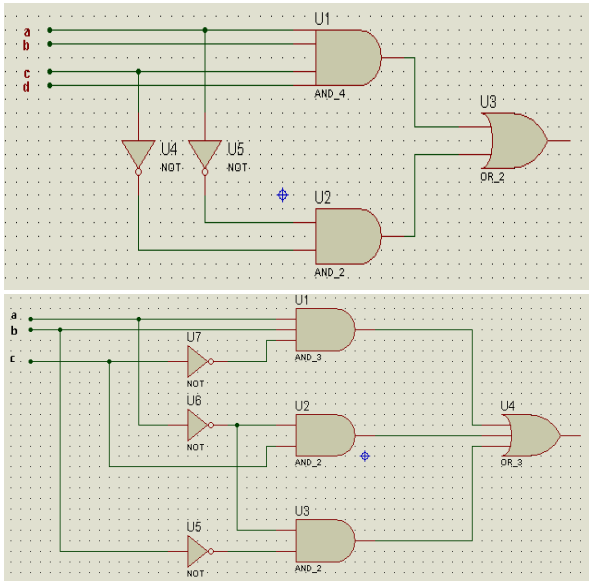
x	y	z	f_1	f_2	f_3
0	0	0	1	1	1
0	0	1	1	1	0
0	1	0	0	1	0
0	1	1	0	0	0
1	0	0	1	0	1
1	0	1	0	1	0
1	1	0	1	1	0
1	1	1	1	1	1

4. Find the canonical POS form of the function f_2 in previous exercise.
5. Express the following functions in canonical SOP and POS forms
   a. $F(w, x, y, z) = z(\overline{w} + x) + \overline{x}z$
   b. $F(w, x, y, z) = \overline{w}\overline{x}z + \overline{y}z + wx\overline{z} + wx\overline{y}$
   c. $F(x, y, z) = (xy + z)(y + xz)$
6. Convert the following to the other canonical form
   a. $F = \sum(0,2,6,11,13,14)$
   b. $F = \prod(0,3,6,7)$

c. F = ∏(1,2,4,6,12)

d. F= ∑(1,3,7)

7. Derive the Boolean expressions and truth tables for the logic circuits show in figure below



(a) (b)

8. Show that the circuits of figures (a) and (b) are equivalent and (c) and (d) are equivalent