

SI100EEE – Introduction to Information Science and Technology

Homework #2 (Due: March 1st)

Problem 1:

For each truth table below, derive a standard SOP and a standard POS expression.

ABC	X	ABC	X	$ABCD$	X	$ABCD$	X
000	0	000	0	0000	1	0000	0
001	1	001	0	0001	1	0001	0
010	0	010	0	0010	0	0010	1
011	0	011	0	0011	1	0011	0
100	1	100	0	0100	0	0100	1
101	1	101	1	0101	1	0101	1
110	0	110	1	0110	1	0110	0
111	1	111	1	0111	0	0111	1
				1000	0	1000	0
				1001	1	1001	0
				1010	0	1010	0
				1011	0	1011	1
				1100	1	1100	1
				1101	0	1101	0
				1110	0	1110	0
				1111	0	1111	1

(a)

(b)

(c)

(d)

Problem 2:

Use a Karnaugh map to reduce each expression to a minimum SOP form:

(a) $A + B\bar{C} + CD$

(b) $\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + ABCD + ABC\bar{D}$

(c) $(\bar{A}\bar{B} + A\bar{B})(CD + C\bar{D})$

Design Problem 3:

Design a logic circuit to produce a HIGH output only if the input, represented by a 4-bit binary number, is greater than twelve or less than three. First develop the truth table, then simplify the logic expression using Karnaugh map, and finally draw the circuit diagram.

Design Problem 4:

Develop the logic circuit necessary to meet the following requirements:

A battery-powered lamp in a room is to be operated from two switches, one at the back door and one at the front door. The lamp is to be on if the front switch is on and the back switch is off, or if the front switch is off and the back switch is on. The lamp is to be off if both switches are off or if both switches are on. Let a HIGH output represent the on condition and a LOW output represent the off condition.