PH-218 Analog & Digital Electronics
Assignment-5 (Due date: 14th April 2011)

(1) Obtain the truth table of the following functions and using the truth table express each
function in sum of minterms and product of maxterms:
(a) \((xy + z)(y + xz)\)
(b) \((A'+B)(B'+C)\)

(2) For the Boolean function \(F\) given in the truth table, find the following:
(a) List the minterms of the function
(b) List the minterms of \(F'\)
(c) Express \(F\) in sums of minterms in algebraic form
(d) Simplify the function to an expression with a minimum number of literals

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(3) Express the following functions in sum of minterms and product of maxterms:
(a) \(F(A, B, C, D) = B'D + A'D + BD\)
(b) \(F(x, y, z) = (xy + z)(xz + y)\)

(4) Simplify the following Boolean functions using Karnaugh map method:
(a) \(F(w, x, y, z) = \Sigma(1, 4, 5, 6, 12, 14, 15)\)
(b) \(F(A, B, C, D) = \Sigma(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)\)
(c) \(f(A, B, C, D) = \Sigma(2, 3, 7, 12, 13, 14, 15)\)
(d) \(f(A, B, C, D) = \Pi(2, 3, 7, 12, 13, 14, 15)\)

(5) Draw the NAND logic diagram for each of the following expressions using multiple-level NAND
gate circuits:
(a) \((AB'+CD')E + BC(A + B)\)
(b) \(w(x + y + z) + xyz\)
(6) An 8-1 multiplexer has inputs $A, B, C$ connected to selection inputs $s_2, s_1$ and $s_0$ respectively. The data inputs $I_0-I_7$ are connected as follows:

$I_0 = I_4 = D$; $I_1 = I_2 = I_7 = 0$; $I_3 = I_5 = 1$; $I_6 = D'$

Determine the Boolean function that the multiplexer implements.

(7) Implement the following Boolean function with an 8-1 multiplexer

$F(A, B, C, D) = \sum(0, 3, 5, 6, 8, 9, 14, 15)$