CODE-CONVERTERS

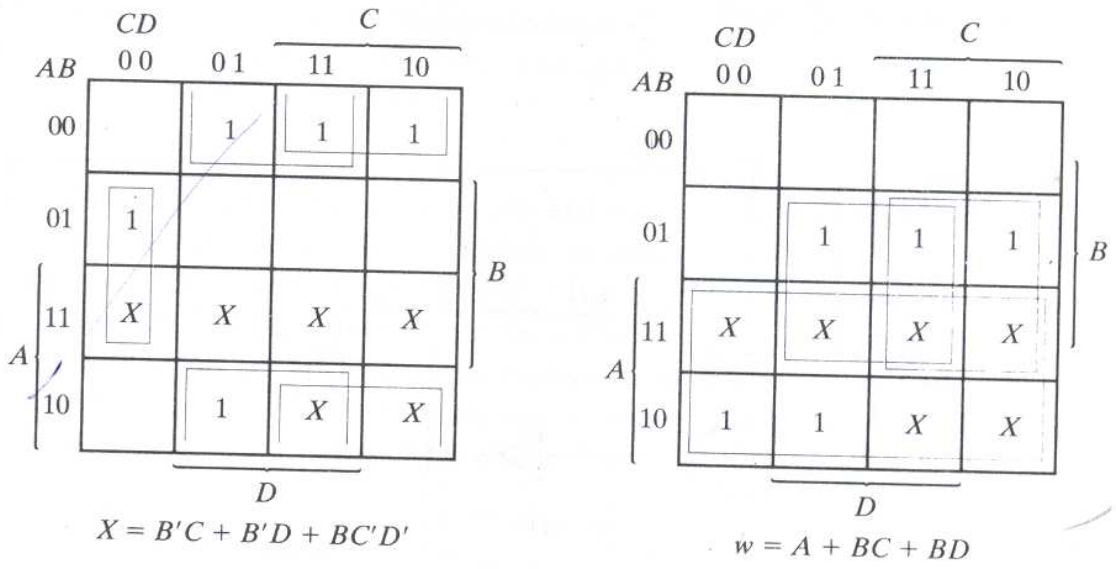
A conversion circuit must be inserted between the two systems if each used different codes for the same information. Thus, a code converter is a circuit that makes the two systems compatible even though each uses a different code.

The bit combination assigned to the BCD and excess -3 codes are listed in table 1. Since each code uses four bits to represent a decimal digit, there must be four input variables and four output variables. Designate the four input binary variables by the symbols A, B, C, D, and the four output variables by w, x, y, and z. The truth table relating the input and output variables is shown in Table 1. The bit combinations for the inputs and their corresponding outputs are obtained directly from section 1-7. Note that four binary variables may have 16 bit combinations, but only 10 are listed in the truth table. The 6 bit combinations not listed for the input variables are don't-care combinations.

The maps in Fig2 are plotted to obtain simplified Boolean functions for the outputs.

Truth Table for Code-Conversion Example

Input BCD				Output Excess-3 Code			
A	*B*	*C*	*D*	*w*	*x*	*y*	*z*
0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0



A two-level logic diagram may be obtained directly from the Boolean expressions derived by the maps. There are various other possibilities for a logic diagram that implements this circuit. The expressions obtained in Fig 2 may be manipulated algebraically for the purpose of using common gates for two or more outputs. This manipulation, shown next, illustrates the flexibility obtained with multiple-output systems when implemented with three or more levels of gates.

Z = D’

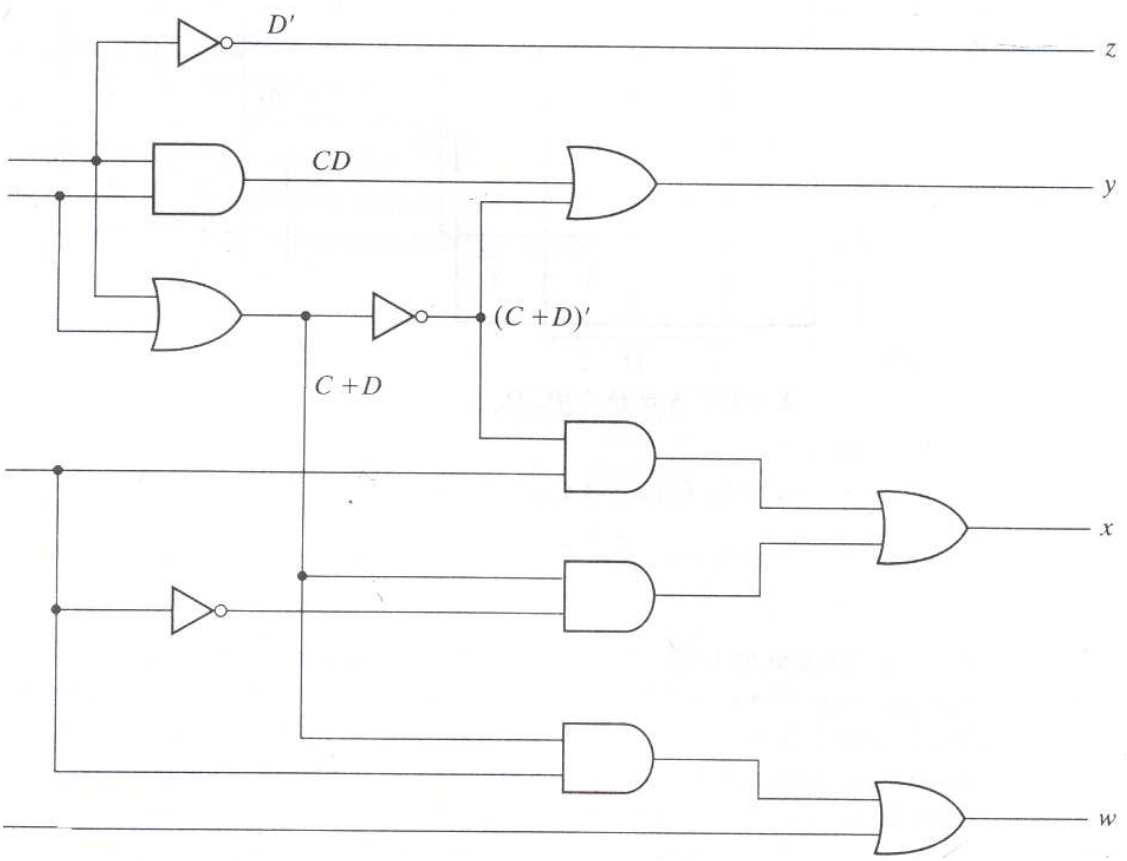
Y = CD + C’D’ = CD + (C + D)’

X = B’C + B’D + BC’D’ = B’ (C + D) + BC’D’

= B’(C + D) + B(C + D)’

W = A + BC + BD = A + B(C +D)

The logic diagram that implements these expressions is shown in Fig 3


D'
z
CD
y
(C + D)'
C + D
x
w