5.14. Note that this is a flow table for a 3-way comparator (problem 5.11a) with 3 outputs. The state assignment shown is of course not the only possible one, but it seems to work well here. The logic expressions are simple enough to be generated by inspection (taking into account that y-state 11 is unused and hence generates a row of don't cares).

	AB 00	01	11	10	y_1y_2
1	1,010	2,001	1,010	3,100	0 0
2	2,001	2,001	2,001	2,001	0 1
3	3,100	3,100	3,100	3,100	1 0

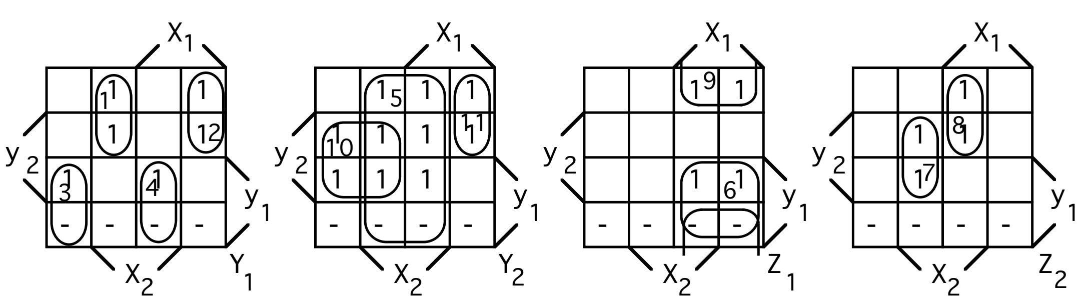
$Y_1 = A\bar{B}\bar{y}_2 + y_1$, $Y_2 = \bar{A}B\bar{y}_1 + y_2$, $Z_1 = Y_1$, $Z_2 = \bar{y}_1\bar{y}_2(\bar{A}\bar{B} + AB) = \overline{Y_1 + Y_2}$, $Z_3 = Y_2$.

5.15. A flow table, as below, is formed from the given table as follows: Consider what happens if a sequence of 2 inputs is applied to the given table, from each state. For example, if 00 is applied with the system in state 1, the first input produces a 0 output and takes the system to state-2. The second input produces a 0 output and takes the system to state 1. Hence, the effect of these 2 inputs is to generate outputs 00 and to make the next state equal to 1. This accounts for the entry 1,00 in the table below. As a second example, if the sequence 01 is applied with the system in state-2, the result is an output of 0 and a transition to state 1, followed by an output of 1 and a transition to state-3. This leads to the entry 3,01 in position 2-01 of the table below. After generating the flow table, we assign y-states as shown-- again this is not the only possible assignment. Next, the Y-Z matrix is produced. Each position contains values of Y1Y2 corresponding to the next state and the values of Z1 and Z2. For example, the entry in row-3, column-11 has the code for next-state 3 (i.e. 11) followed by the outputs 10, corresponding to the entry 3,10 in the flow matrix. The K-maps are then easily produced from the Y-Z matrix, and an optimal set of SOP expressions is then derived using the methods of subsection 3.5.1.

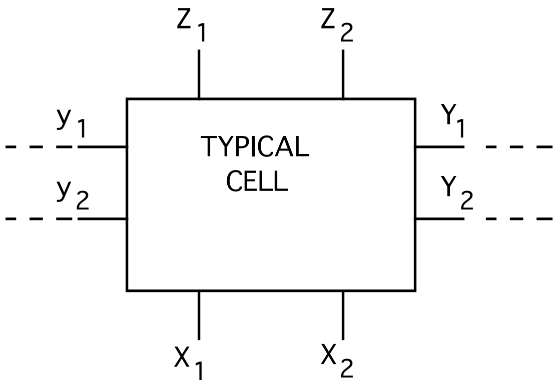
	X_1X_2 00	01	11	10	y_1y_2
1	1,00	3,00	2,11	3,10	0 0
2	2,00	3,01	2,01	3,00	0 1
3	3,00	2,01	3,10	1,10	1 1

	X_1X_2 00	01	11	10	y_1y_2
1	0000	1100	0111	1110	0 0
2	0100	1101	0101	1100	0 1
3	1100	0101	1110	0010	1 1

$Y_1Y_2Z_1Z_2$



$Y_1 = \bar{X}_1 X_2 \bar{y}_1 + X_1 \bar{X}_2 \bar{y}_1 + \bar{X}_1 \bar{X}_2 y_1 + X_1 X_2 y_1$, $Y_2 = X_2 + \bar{X}_1 y_2 + \underline{X_1 \bar{X}_2 \bar{y}_1}$, $Z_3 = X_1 y_1 + X_1 \bar{y}_2$, $Z_4 = \bar{X}_1 X_2 y_2 + X_1 X_2 \bar{y}_1$. A block diagram of a typical cell is shown below. Each cell receives a pair of the X-inputs, i.e. the first cell receives the first 2 X-inputs, the second cell receives the third and fourth inputs, etc. Similarly, each cell generates a pair of the Z-outputs, as well as the Y-signals for transmission to the next cell (as y-inputs).

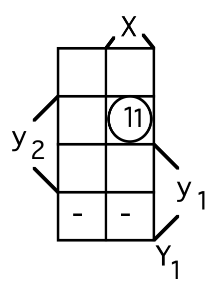


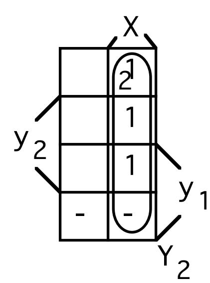
5.16. The flow matrix, Y-Z matrix and K-maps for Y1, Y2 and Z are shown below. This leads to the SOP expressions: $Y_1 = X\bar{y}_1 y_2$, $Y_2 = X$, $Z = \bar{X} y_1$. Although the expressions are different, the cost in gate inputs happens to be the same as for the state assignment of Fig. 5.13.

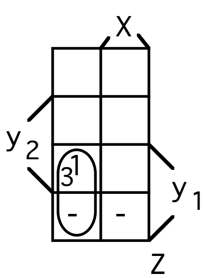
	X = 0	X = 1	y_1y_2
1	1,0	2,0	0 0
2	1,0	3,0	0 1
3	1,1	2,0	1 1

	X = 0	X = 1	y_1y_2
1	000	010	0 0
2	000	110	0 1
3	001	010	1 1

Y_1Y_2 Z







NT-1.

	w
M_0	0
M_1	1

State	y
1	0
2	1

Primary Cells: $Z = X \oplus y$, $W = X$

Interior cells: $W=w_L+w_R$, $Y=w_R+y$