# Digital System Design

Add $R_x, R_y$

$$[R_x] + [R_y] \longrightarrow R_x$$

in order for this to happen.

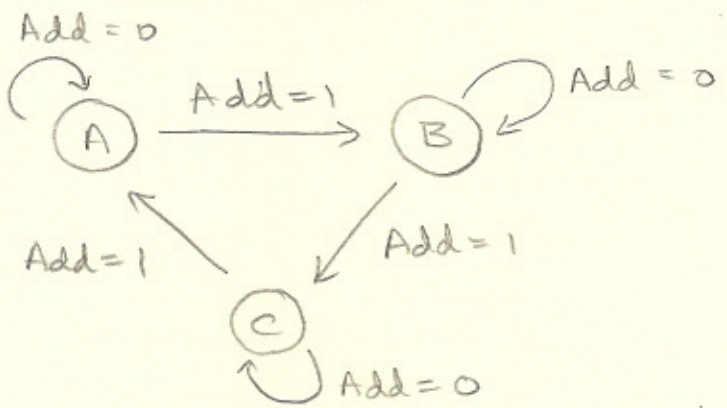
$t+1$ : $R_{xout} = 1$ , $R_{yout} = 1$

$t+2$ : $R_{Aout} = 1$ , $R_{yout} = 1$, $R_B = 1$, $R_{cin} = 1$

$t+3$ : $R_{cout} = 1$, $R_{xin} = 1$

This can all be represented by a Sequentiel Circuit (Synchronous)

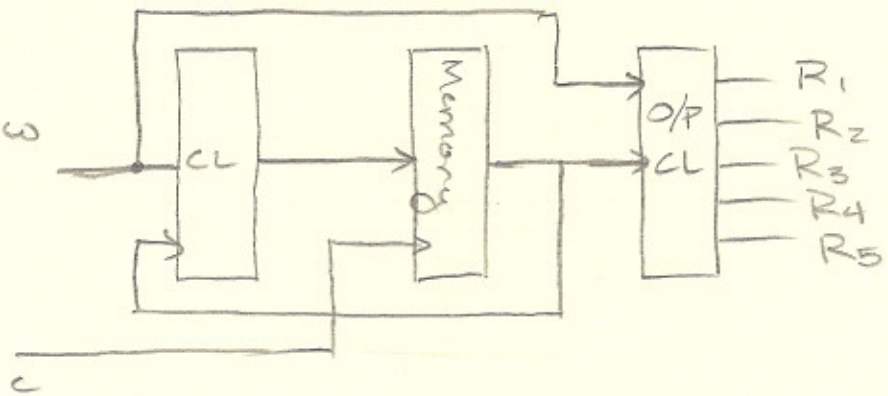
## Add-0 state diagram.



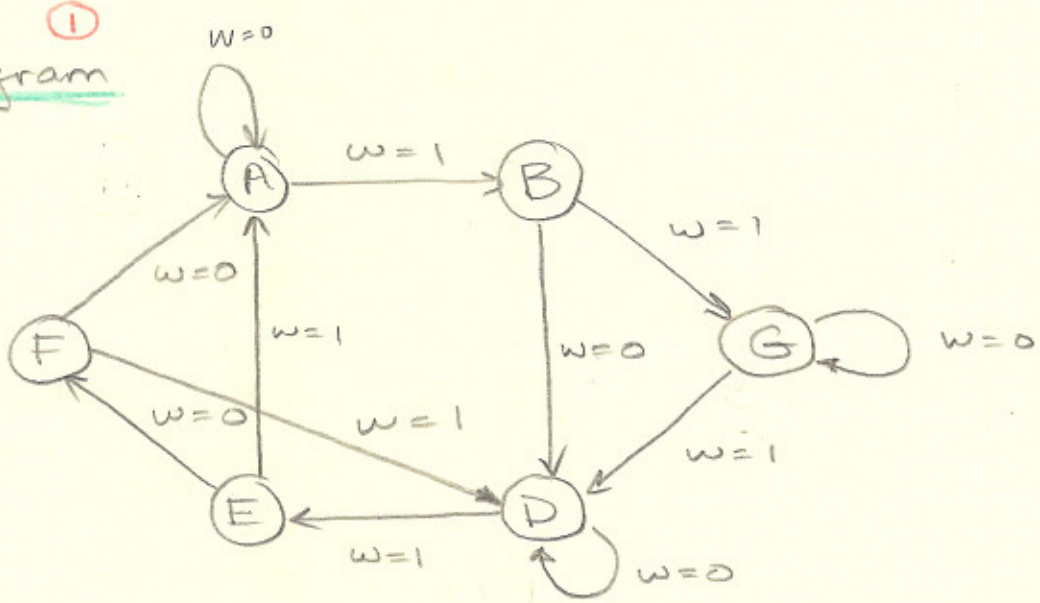

state A corresponds to $t+1$

B $t+2$

C $t+3$




State Diagram (1)




State Table (2)

| Current State | w = 0 | w = 1 | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ |
|---|---|---|---|---|---|---|---|
| A | A | B | 1 | 1 | 0 | 0 | 0 |
| B | D | C | 1 | 1 | 0 | 1 | 0 |
| C | C | D | 0 | 0 | 1 | 0 | 0 |
| D | D | E | 1 | 1 | 1 | 1 | 0 |
| E | F | A | 0 | 1 | 0 | 1 | 0 |
| F | A | D | 0 | 0 | 1 | 0 | 0 |

Next State | Outputs

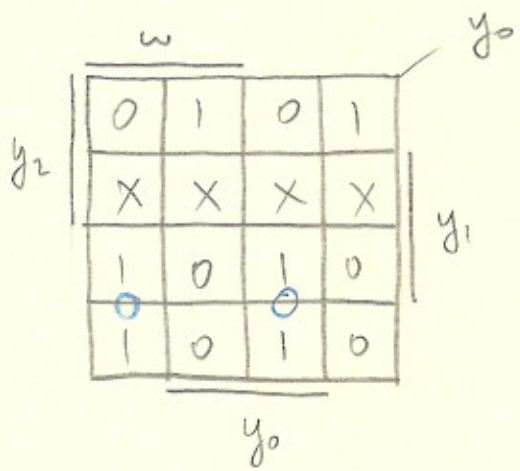
## State Assignment (3)

| State | $y_2$ | $y_1$ | $y_0$ | |
|---|---|---|---|---|
| A | 0 | 0 | 0 | |
| B | 0 | 0 | 1 | |
| C | 0 | 1 | 0 | |
| D | 0 | 1 | 1 | |
| E | 1 | 0 | 0 | |
| F | 1 | 0 | 1 | |
| X | 1 | 1 | 0 | } there is no correspond states /bits. |
| X | 1 | 1 | 1 | |

## State Assignment table (4)

| Current State | | | Next State w=1 | | | Next State w=0 | | | Outputs | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $y_2$ | $y_1$ | $y_0$ | $y_2$ | $y_1$ | $y_0$ | $y_2$ | $y_1$ | $y_0$ | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $B_5$ |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | # | 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |

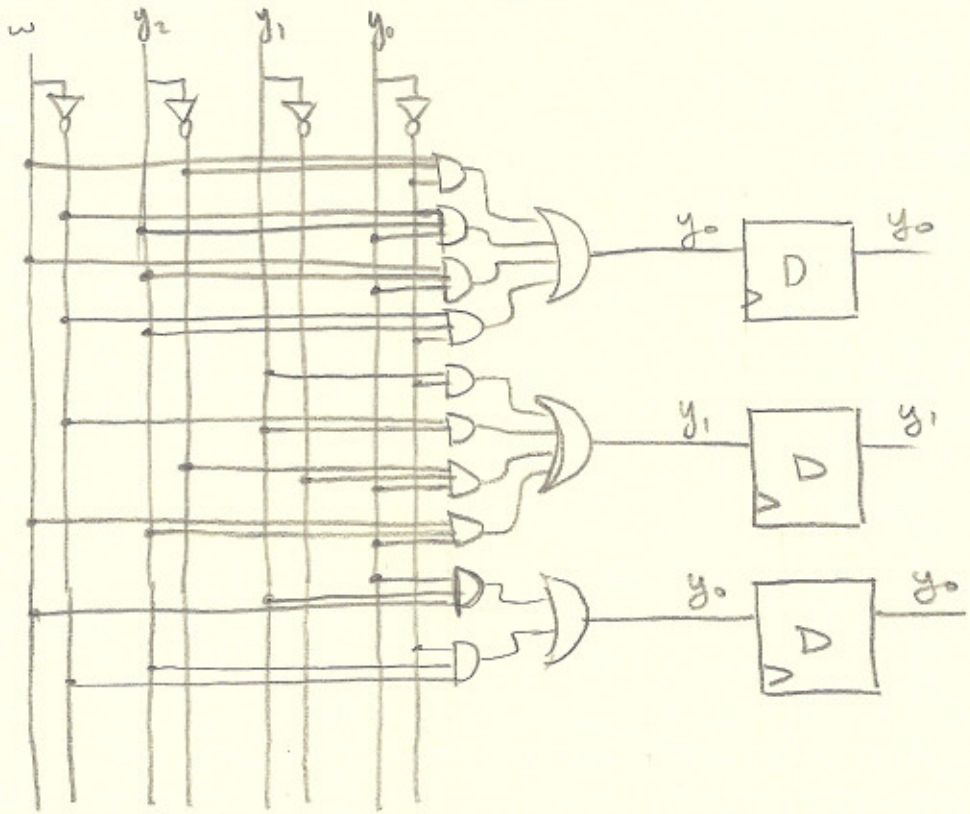
## Kernal Map (5)



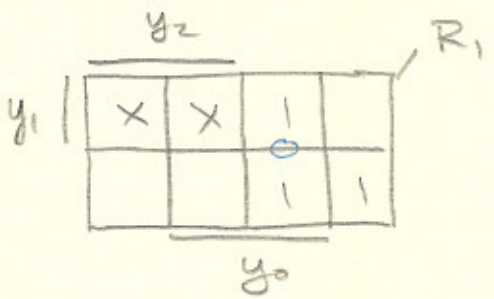

$$y_0 = w \cdot \overline{y_2} \cdot \overline{y_0} + \overline{w} \cdot \overline{y_2}\, y_0 + w \cdot y_2 \cdot y_0 + y_2 \cdot \overline{w}\, \overline{y_0}$$

Complete the other 2 kernal maps.

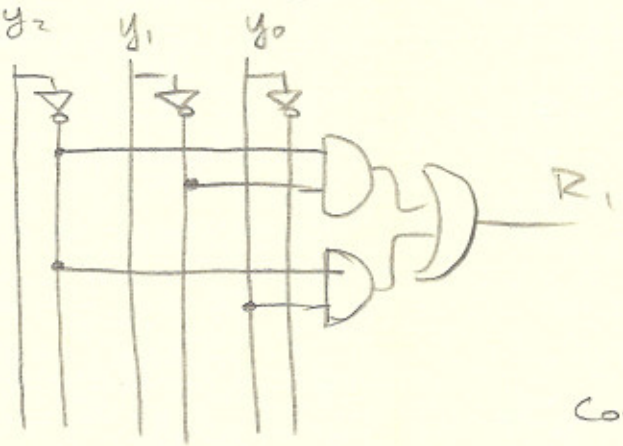
## Design




## Input CC (6)




$$R_1 = \overline{y_2}\,\overline{y_1} + \overline{y_2}\cdot y_0$$




Continue in a similar manner for $R_2 \rightarrow R_5$