Exercise 7.24
Since two different patterns are generated, the system consists of two independent pattern generators, let’s call these systems $A$ and $B$. The corresponding state diagram is given in Figure 7.8. The states $S_Ai$ belongs to system $A$ and states $S_Bi$ belongs to system $B$.

Exercise 7.25
To make the design simple and tractable, we make the following assumptions:

- Selection of stamps to buy is the first step
- If amount of accumulated coins is at least 15c greater than the face value of the selected stamp, return all coins

Then the inputs and outputs are as follows (ref. Figure 7.9):

Inputs:

\[ \text{Reset} : \in \{ T, F \} \]
CoinType : $\in \{N, D, Q\}$
StampType : $\in \{S1(20c), S2(40c), S3(50c)\}$
ReturnCoinRequest : $\in \{T, F\}$

Outputs:

- $RS1$ – Release stamp 1 (20c)
- $RS2$ – Release stamp 2 (40c)
- $RS3$ – Release stamp 3 (50c)
- $RC$ – Return Coin
- $RN$ – Return Nickel
- $RD$ – Return Dime

All outputs take values from the set $\{T, F\}$. The state diagram is shown in Figure 7.10.

Figure 7.9: Inputs & Outputs of Vending Machine Controller
Note: We did not draw the transitions corresponding to inputs RESET and Return Coin Request. Basically, for every state, its next state with the above inputs should be the same - go back to State Wait. In the meantime, RC is true to return all coins deposited so far.

Figure 7.10: State Diagram of Exercise 7.25