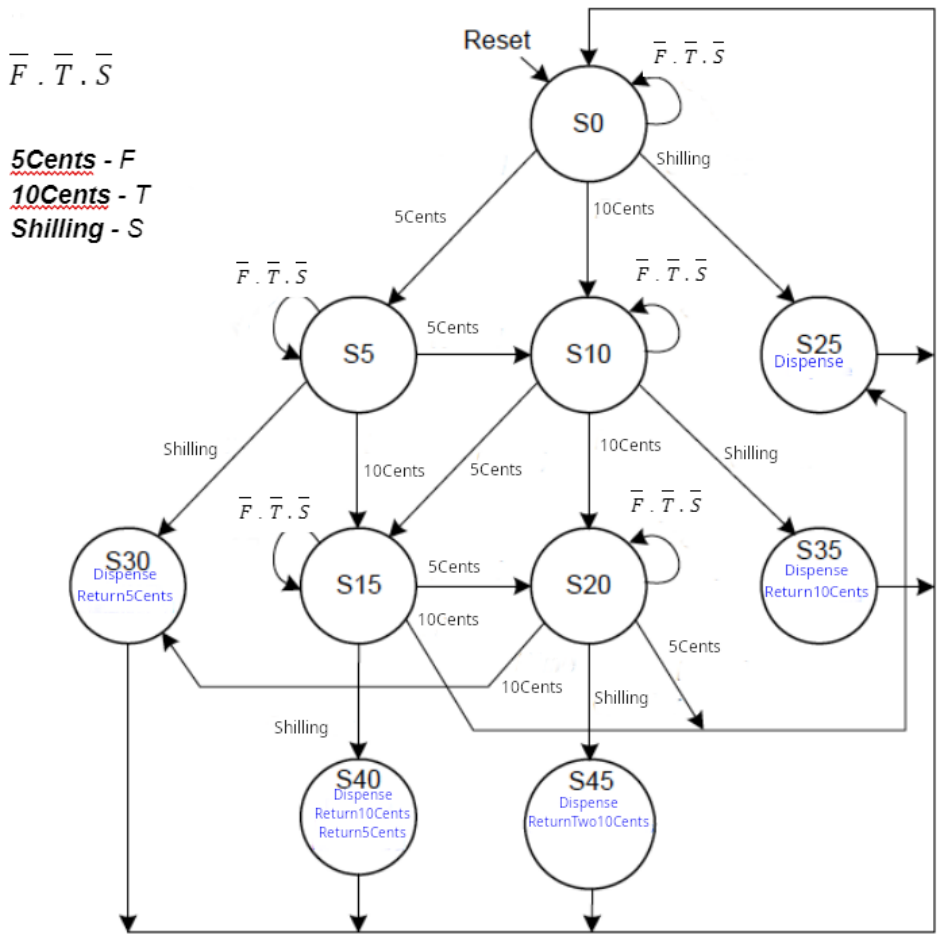
Imer Lopez
Final Project
Digital Logic - CMPS4252

Soda Machine Dispenser For the IT Department Students' Lounge

FSM:

5 Cents *- F*
10 Cents *- T*
25 Cents *- S*



State Encoding Table:

State	Encoding $S_{9:0}$									
	S_9	S_8	S_7	S_6	S_5	S_4	S_3	S_2	S_1	S_0
S0	0	0	0	0	0	0	0	0	0	1
S5	0	0	0	0	0	0	0	0	1	0
S10	0	0	0	0	0	0	0	1	0	0
S15	0	0	0	0	0	0	1	0	0	0
S20	0	0	0	0	0	1	0	0	0	0
S25	0	0	0	0	1	0	0	0	0	0
S30	0	0	0	1	0	0	0	0	0	0
S35	0	0	1	0	0	0	0	0	0	0
S40	0	1	0	0	0	0	0	0	0	0
S45	1	0	0	0	0	0	0	0	0	0

State Transition Table and Simplified Equations:

Current State										Input			Next State								
S_9	S_8	S_7	S_6	S_5	S_4	S_3	S_2	S_1	S_0	F	T	S	S'_9	S'_8	S'_7	S'_6	S'_5	S'_4	S'_3	S'_2	S'_1	S'_0
0	0	0	0	0	0	0	0	0	1	**1**	**x**	**x**	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	1	**x**	**1**	**x**	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	1	**x**	**x**	**1**	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	**0**	**0**	**0**	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	1	0	**1**	**x**	**x**	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	1	0	**x**	**1**	**x**	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	1	0	**x**	**x**	**1**	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	**0**	**0**	**0**	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1	0	0	**1**	**x**	**x**	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	1	0	0	**x**	**1**	**x**	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	1	0	0	**x**	**x**	**1**	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	**0**	**0**	**0**	0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	1	0	0	0	**1**	**x**	**x**	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	1	0	0	0	**x**	**1**	**x**	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	**x**	**x**	**1**	0	1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	**0**	**0**	**0**	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0	0	0	**1**	**x**	**x**	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	**x**	**1**	**x**	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	**x**	**x**	**1**	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	**0**	**0**	**0**	0	0	0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0	0	0	**x**	**x**	**x**	0	0	0	0	0	0	0	0	0	1
0	0	0	1	0	0	0	0	0	0	**x**	**x**	**x**	0	0	0	0	0	0	0	0	0	1

0	0	1	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	1
0	1	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0	0	1

$$S'_9 = S_4 S$$
$$S'_8 = S_3 S$$
$$S'_7 = S_2 S$$
$$S'_6 = S_1 S + S_4 T$$
$$S'_5 = S_0 S + S_3 T + S_4 F$$
$$S'_4 = S_2 T + S_3 F + S_4 \overline{F}\,\overline{T}\,\overline{S}$$
$$S'_3 = S_1 T + S_2 F + S_3 \overline{F}\,\overline{T}\,\overline{S}$$
$$S'_2 = S_0 T + S_1 F + S_2 \overline{F}\,\overline{T}\,\overline{S}$$
$$S'_1 = S_0 F + S_1 \overline{F}\,\overline{T}\,\overline{S}$$
$$S'_0 = S_0 \overline{F}\,\overline{T}\,\overline{S} + S_5 + S_6 + S_7 + S_8 + S_9$$

Output table and Equations

Current State										Output			
S_9	S_8	S_7	S_6	S_5	S_4	S_3	S_2	S_1	S_0	D	RF	RT	R2
0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0	1	0	0	0
0	0	0	1	0	0	0	0	0	0	1	1	0	0
0	0	1	0	0	0	0	0	0	0	1	0	1	0
0	1	0	0	0	0	0	0	0	0	1	1	1	0
1	0	0	0	0	0	0	0	0	0	1	0	0	1

D = Dispense
RF = ReturnFiveCents
RT = ReturnTenCents
R2 = ReturnTwoTenCents

Dispense = $S_5 + S_6 + S_7 + S_8 + S_9$

ReturnFiveCents = $S_6 + S_8$

ReturnTenCents = $S_7 + S_8$

ReturnTwoTenCents= S_9

Circuit Diagram: