State Transition Graph:

The Double circled states in the graph are final states and revert back to initial state.

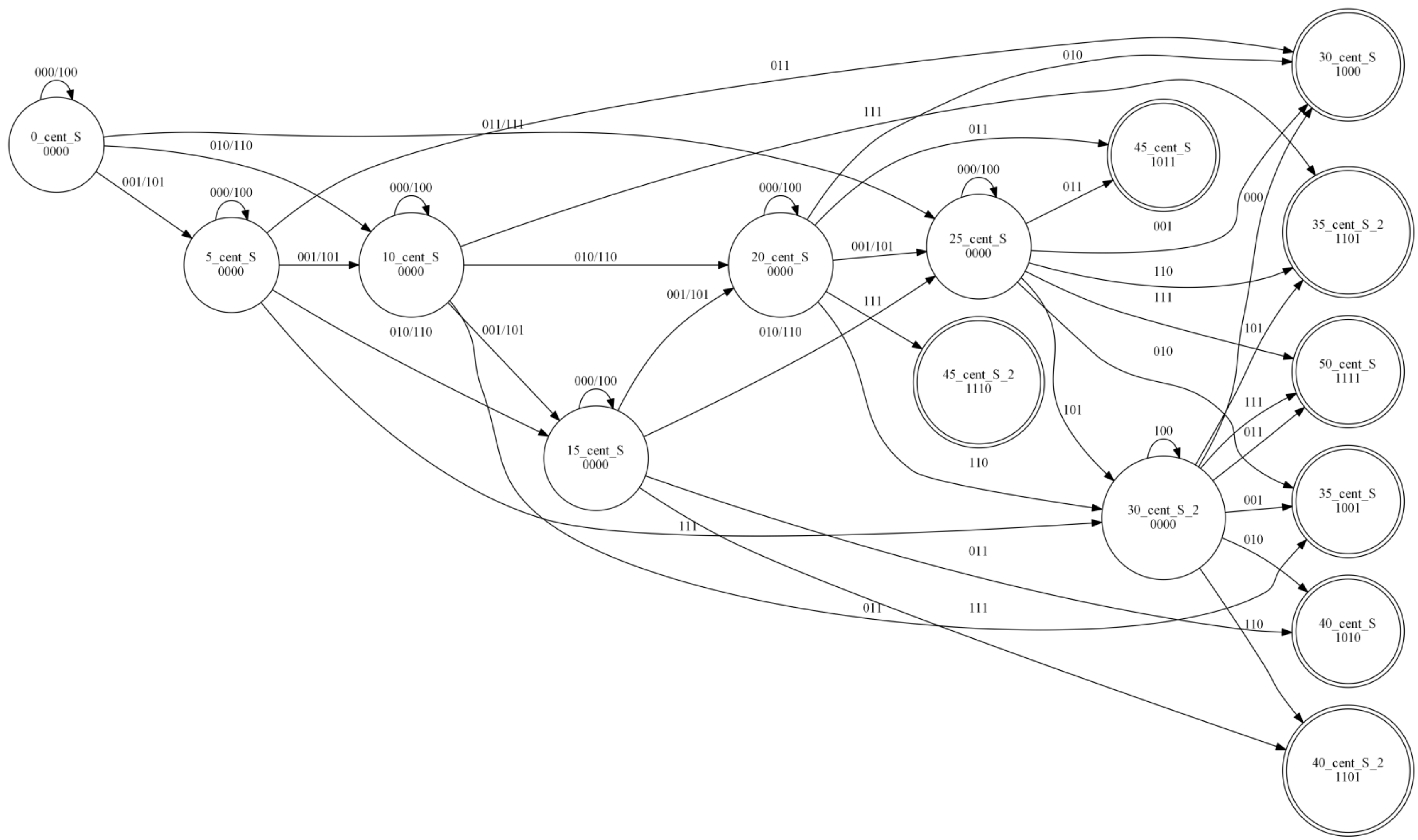
States	Values
0_cent_S	b0000
5_cent_S	b0001
10_cent_S	b0010
15_cent_S	b0011
20_cent_S	b0100
25_cent_S	b0101
30_cent_S	b0110
30_cent_S_2	b0111
35_cent_S	b1000
35_cent_S_2	b1001
40_cent_S	b1010
40_cent_S_2	b1011
45_cent_S	b1100
45_cent_S_2	b1101
50_cent_S	b1110

Input bits:

Two input bits have been used to represent 0 cents, a nickel, a quarter and a dime. (**LSB bits**)	One input bit is for selecting 30 cent or 35 cent candy. (**MSB**)
b00: 0 cent	b0: 30 cent candy
b01: Nickle input	b1: 35 cent candy
b10: Dime Input	
b11: Quarter Input	

Output Bits:

Two output bits are reserved for no candy, 30 cent candy and 35 cent candy outputs. (**LSB bits**)	Two more bits are reserved for amount of change given back. (**MSB bits**)
b00: N/A	b00: No change
b01: No candy	b01: 5 cent change
b10: 30 cent candy	b10: 10 cent change
b11: 35 cent candy	b11: 15 cent change



0_cent_S
0000
5_cent_S
0000
10_cent_S
0000
15_cent_S
0000
20_cent_S
0000
25_cent_S
0000
30_cent_S_2
0000
45_cent_S_2
1110
45_cent_S
1011
30_cent_S
1000
35_cent_S_2
1101
50_cent_S
1111
35_cent_S
1001
40_cent_S
1010
40_cent_S_2
1101
000/100
001/101
010/110
011/111
011
111
110
101
100
010
001
000

Next state Table:

No.	Present State	Input Bits		Next State	Output
0	0_cent_S	"000/100"		0_cent_S	"0000"
1	0_cent_S	"001/101"		5_cent_S	"0000"
2	0_cent_S	"010/110"		10_cent_S	"0000"
3	0_cent_S	"011/111"		25_cent_S	"0000"
4	5_cent_S	"000/100"		5_cent_S	"0000"
5	5_cent_S	"001/101"		10_cent_S	"0000"
6	5_cent_S	"010/110"		15_cent_S	"0000"
7	5_cent_S	"011"		30_cent_S	"1000"
8	5_cent_S	"111"		30_cent_S_2	"0000"
9	10_cent_S	"000/100"		10_cent_S	"0000"
10	10_cent_S	"001/101"		15_cent_S	"0000"
11	10_cent_S	"010/110"		20_cent_S	"0000"
12	10_cent_S	"011"		35_cent_S	"1001"
13	10_cent_S	"111"		35_cent_S_2	"1100"
14	15_cent_S	"000/100"		15_cent_S	"0000"
15	15_cent_S	"001/101"		20_cent_S	"0000"
16	15_cent_S	"010/110"		25_cent_S	"0000"
17	15_cent_S	"011"		40_cent_S	"1010"
18	15_cent_S	"111"		40_cent_S_2	"1101"
19	20_cent_S	"000/100"		20_cent_S	"0000"
20	20_cent_S	"001/101"		25_cent_S	"0000"
21	20_cent_S	"010"		30_cent_S	"1000"
22	20_cent_S	"011"		45_cent_S	"1011"
23	20_cent_S	"110"		30_cent_S_2	"0000"
24	20_cent_S	"111"		45_cent_S_2	"1110"
25	25_cent_S	"000/100"		25_cent_S	"0000"
26	25_cent_S	"001"		30_cent_S	"1000"
27	25_cent_S	"010"		35_cent_S	"1001"
28	25_cent_S	"011"		45_cent_S	"1011"
29	25_cent_S	"101"		30_cent_S_2	"0000"
30	25_cent_S	"110"		35_cent_S_2	"1100"
31	25_cent_S	"111"		50_cent_S	"1111"
32	30_cent_S_2	"000"		30_cent_S	"1000"
33	30_cent_S_2	"001"		35_cent_S	"1001"
34	30_cent_S_2	"010"		40_cent_S	"1010"
35	30_cent_S_2	"011"		50_cent_S	"1111"

36	30_cent_S_2	"100"		30_cent_S_2	"0000"
37	30_cent_S_2	"101"		35_cent_S_2	"1100"
38	30_cent_S_2	"110"		40_cent_S_2	"1101"
39	30_cent_S_2	"111"		50_cent_S	"1111"

Shannon's expansion:

Assuming three input bits to be decomposed by the Shannon decomposition, leaving only state value bits in the truth table with 8x1 mux having three bit select lines from the input bits, following equations of 8 smaller circuits are produced at inputs of the mux.

Here "ABCD" are present state bits with A as MSB and D as LSB and "WXYZ" are output bits with W as MSB and Z as LSB. All the outputs are in minimized state.

For select line 000:

```
W = A' B C D;
X = 0;
Y = 0;
Z = 0;
```

For select line 001:

```
W = A' B D;
X = 0;
Y = 0;
Z = A' B C D;
```

For Select line 010:

```
W = A' B C' + A' B D;
X = 0;
Y = A' B C D;
Z = A' B C' D;
```

For Select line 011:

```
W = A' D + A' B' C + A' B C';
X = A' B C D;
Y = A' B C' + A' C D;
Z = A' B C' + A' B D + A' B' C D';
```

For Select line 100:

```
W = 0;
X = 0;
Y = 0;
Z = 0;
```

For Select line 101:

```
W = A' B C D;
X = A' B C D;
Y = 0;
Z = 0;
```

For Select line 110:

```
W = A' B D;
X = A' B D;
Y = 0;
Z = A' B C D;
```

For Select line 111:

```
W = A' B C' + A' C D + A' B' D';
X = A' B' C + A' B C' + A' C D;
Y = A' B C' + A' B D;
Z = A' B D + A' C D;
```

Final Circuit Diagram: