

Homework - 3

1.) 2-bit $\xrightarrow{\hspace{1cm}}$ encoding

Ans

given 2 bit binary number: Encoding [1:0] Value

00	0
01	1
10	2
11	3

$$X[1:0] = X_1, X_0$$

$$Y[1:0] = Y_1, Y_0$$

X_1, X_0	Y_1, Y_0	$X > Y$
00	00	0
00	01	0
00	10	0
00	11	0
01	00	1
01	01	0
01	10	0
01	11	0
10	00	1
10	01	1
10	10	0
10	11	0
11	00	1
11	01	1
11	10	1
11	11	0

$$\begin{array}{l} \cancel{X_1 X_0} \\ \cancel{Y_1 Y_0} \\ \hline \end{array}$$

00	01	11	10
00	0	0	0
01	1	0	0
11	1	1	0
10	1	1	0

$$X > Y = 01$$

$$\boxed{X > Y = X_1 X_0 Y_0 + X_1 Y_1 + X_0 Y_1 Y_0}$$

$$\begin{aligned} X > Y = & X_1 X_0 Y_0 + X_1 \cancel{Y_1} \\ & + X_0 \cancel{Y_1} + \cancel{Y_0} \end{aligned}$$

2

Module XgreaterY (X, Y, XgreaterY);

Input logic [0:D] X, Y;

Output logic XgreaterY;

Wire [1:6] u;

And U₁ (w[1], Y[1]);

And U₂ (w[2], Y[0]);

And U₃ (w[3], X[1], X[0], Y[0]);

And U₄ (w[4], X[1], w[1]);

And U₅ (w[5], X[0], w[2], w[0]);

Or U₆ (XgreaterY, w[3], w[4], w[5]);

end module;

Q3

The One -

$Z[2:0]$

A3 =

Input	Output (One Count)	
$z_2 \ z_1 \ z_0$	y_1	y_0
0 0 0	0	0
0 0 1	0	1
0 1 0	0	1
0 1 1	1	0
1 0 0	0	1
1 0 1	1	0
1 1 0	1	0
1 1 1	1	1

$$\begin{array}{c} z_2 \\ z_1 \\ z_0 \\ \hline \end{array}$$

0	0	0	0
0	0	1	1
1	0	1	1
1	1	1	1

$$Y_1 = \underline{\underline{z_2}} \underline{\underline{z_1}} \underline{\underline{z_0}}$$

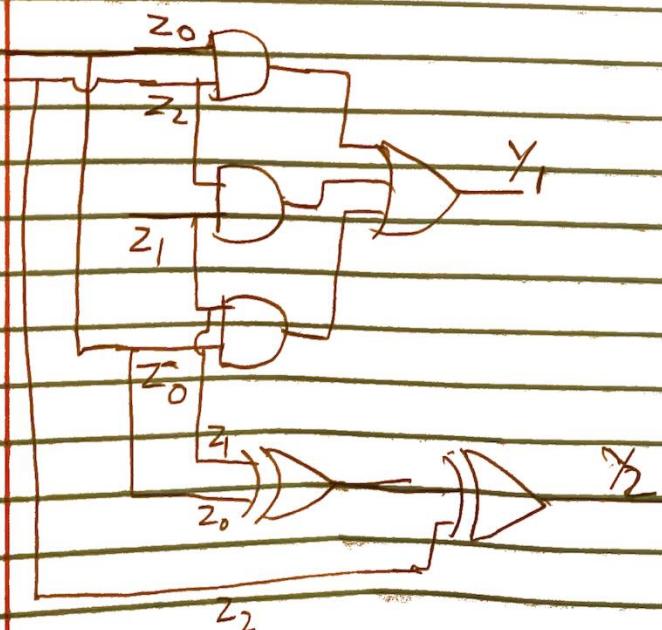
$$\begin{array}{c} z_2 \\ z_1 \\ z_0 \\ \hline \end{array}$$

0	0	0	0
0	0	1	1
1	0	1	1
1	1	1	0

$$Y_0 = \underline{\underline{z_2}} \underline{\underline{z_1}} \underline{\underline{z_0}}$$

$$Y_1 = z_2 z_0 + z_2 z_1 + z_1 z_0$$

$$Y_0 = z_2 \oplus z_1 \oplus z_0$$



$$\text{One Count} = Y_1 Y_2$$

④ We - - - - - Period

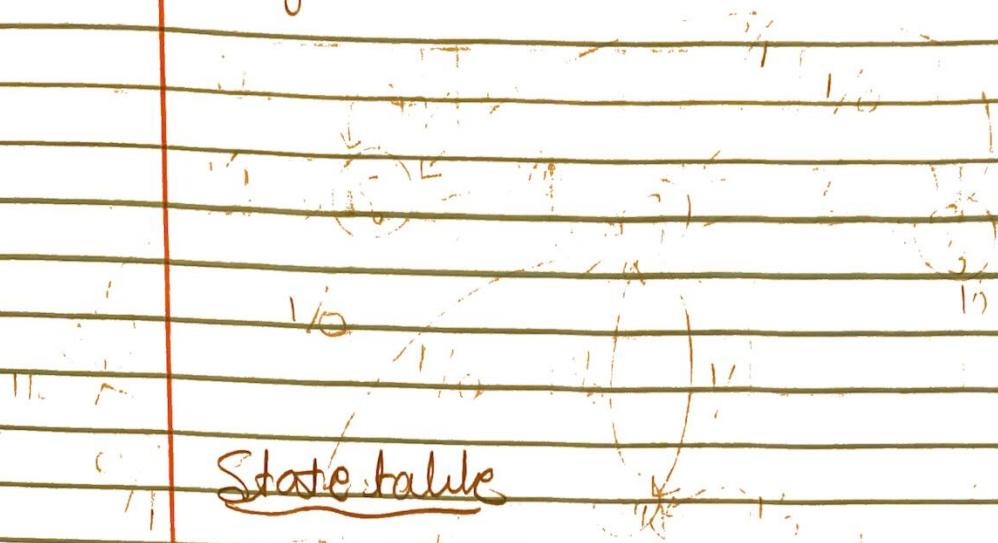
D

CLR

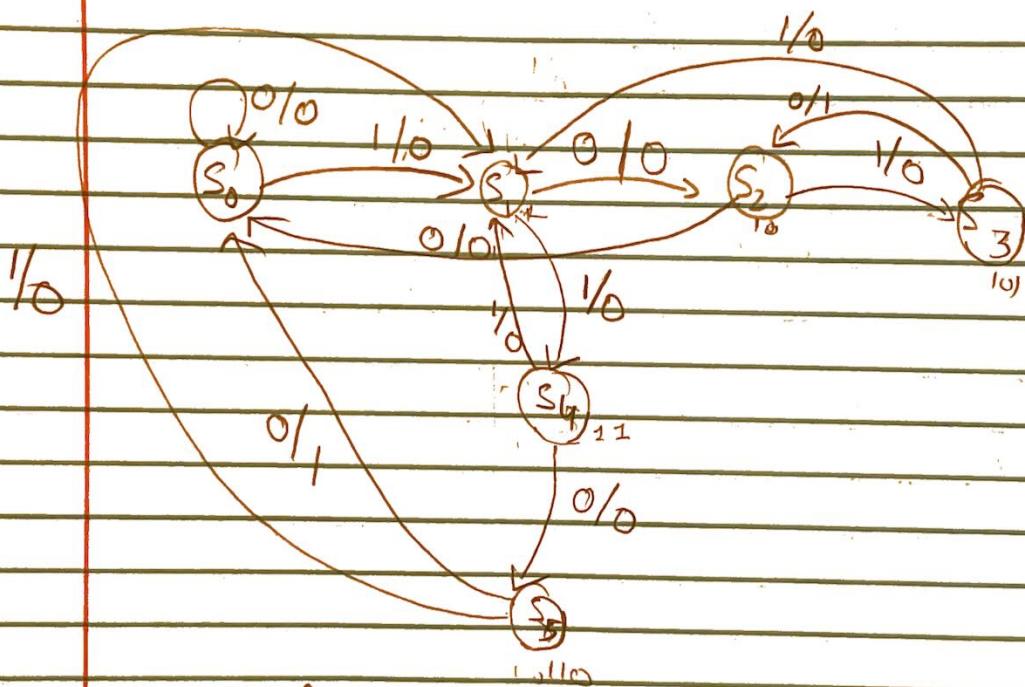
Off
+ Trade

On
- ve edge

Q5 → Design - "1100" or "1010" - - - D/A



State table



State Assignment

$$S_0 = 000$$

$$S_1 = 001$$

$$S_2 = 010$$

$$S_3 = 011$$

$$S_4 = 100$$

$$S_5 = 101$$

PS	I	Out	NS	State	
P_{S_2}	P_{S_1}	P_{S_0}	NS_2	NS_1	NS_0
0	0	0	0	0	S_0
0	0	0	1	0	S_1
0	0	1	0	1	S_2
0	0	1	1	0	S_4
0	1	0	0	0	S_0
0	1	0	1	1	S_3
0	1	1	0	1	S_2
0	1	1	1	0	S_1
1	0	0	0	1	S_5
1	0	0	1	0	S_1
1	0	1	0	0	S_0
1	0	1	1	1	S_1
1	1	0	0	X	X
1	1	0	1	X	X
1	1	1	0	X	X
1	1	1	1	X	X

$\cancel{P_{S_2} P_{S_1}} \cancel{P_{S_0} I}$

$\cancel{P_{S_2} P_{S_1}} \cancel{P_{S_0} I}$

Out 2

0	0	0	0	
0	0	0	0	T
1	X	X	X	X
1	0	0	0	T

NS_2

0	0	0	0	
0	0	0	0	
1	X	X	X	X
1	1	0	0	0

$$Out = P_{S_2} P_{S_0} I + P_{S_1} P_{S_0} I$$

$$NS_2 = P_{S_2} \cancel{P_{S_0} I} + \cancel{P_{S_2} P_{S_1}} P_{S_0} I$$

$\cancel{P_{S_2} P_{S_1}} \cancel{P_{S_0} I}$

$\cancel{P_{S_2} P_{S_1}} \cancel{P_{S_0} I}$

0	0	0	0	
0	0	T	0	T
1	X	X	X	X
1	0	0	0	0

$NS_1 =$

0	1	1	0	0
0	1	T	T	0
1	X	X	X	X
1	1	1	1	0

$$NS_1 = P_{S_1} \cancel{P_{S_0} I} + \cancel{P_{S_2} P_{S_0}} T$$

$$NS_0 = P_{S_0} T + P_{S_2} \cancel{P_{S_0} I} + P_{S_1} I + P_{S_1} T$$

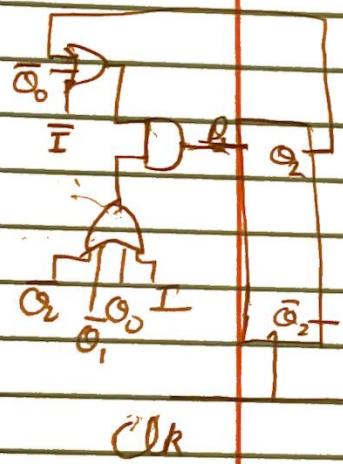
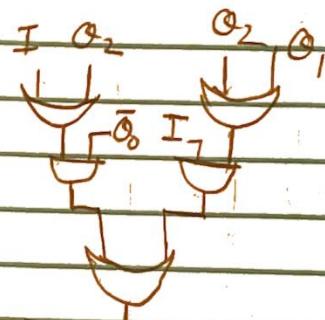
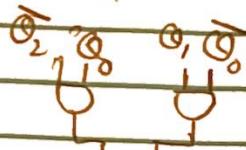
$$\text{Output} = P_{S_0} I (P_{S_2} + P_{S_1}) = Q_0 I (Q_2 + Q_1)$$

$$NS_2 = D_2 = P_{S_2} \bar{P}_{S_0} I + P_{S_2} P_{S_1} \bar{P}_{S_0} I$$

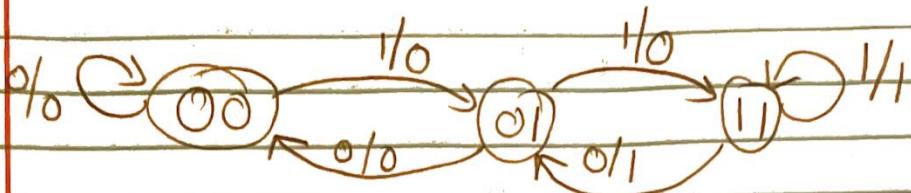
$$D_2 = Q_2 \bar{Q}_0 I + Q_2 Q_1 \bar{Q}_0 I$$

$$NS_1 = D_1 = P_{S_1} \bar{P}_{S_0} I + \bar{P}_{S_2} P_{S_0} I = (Q_1 \bar{Q}_0 + Q_2 Q_0) I$$

$$Q_0 = NS_0 = P_{S_0} I + P_{S_2} \bar{P}_{S_0} + P_{S_2} I + \bar{P}_{S_1} I = \bar{Q}_0 (I + Q_2) + I (Q_2 + Q_1)$$



③ 6 → Create ----- Diff

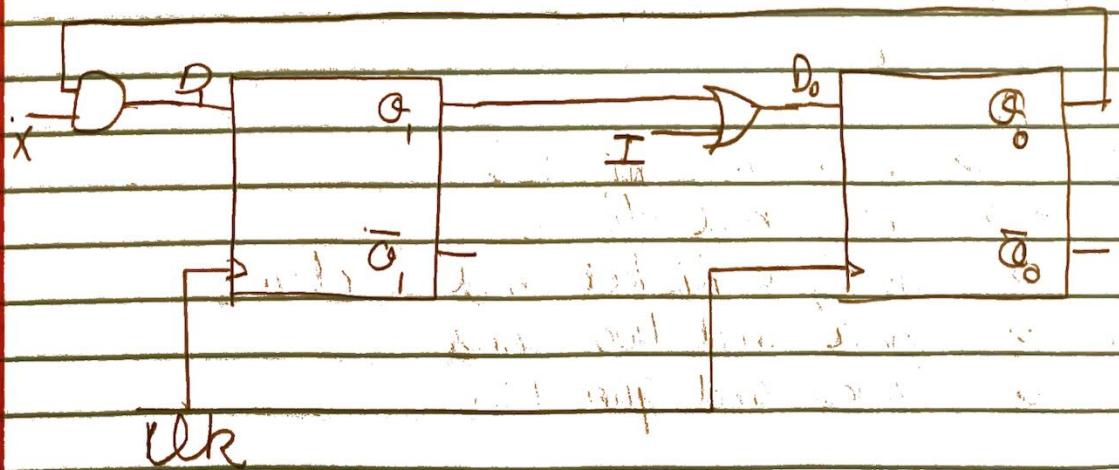


P_1	∞	0	1	4	10
0	0	0	1	0	0
1	x	x	1	0	0

$$P_1 \begin{pmatrix} P_0 & I \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 & 1 & 1 & 0 \\ x & \alpha & 1 & 1 & 1 \end{pmatrix}$$

$$\mathbf{D}_1 = \rho_0 \mathbf{I}$$

$$D_0 = P_I + I$$



7)

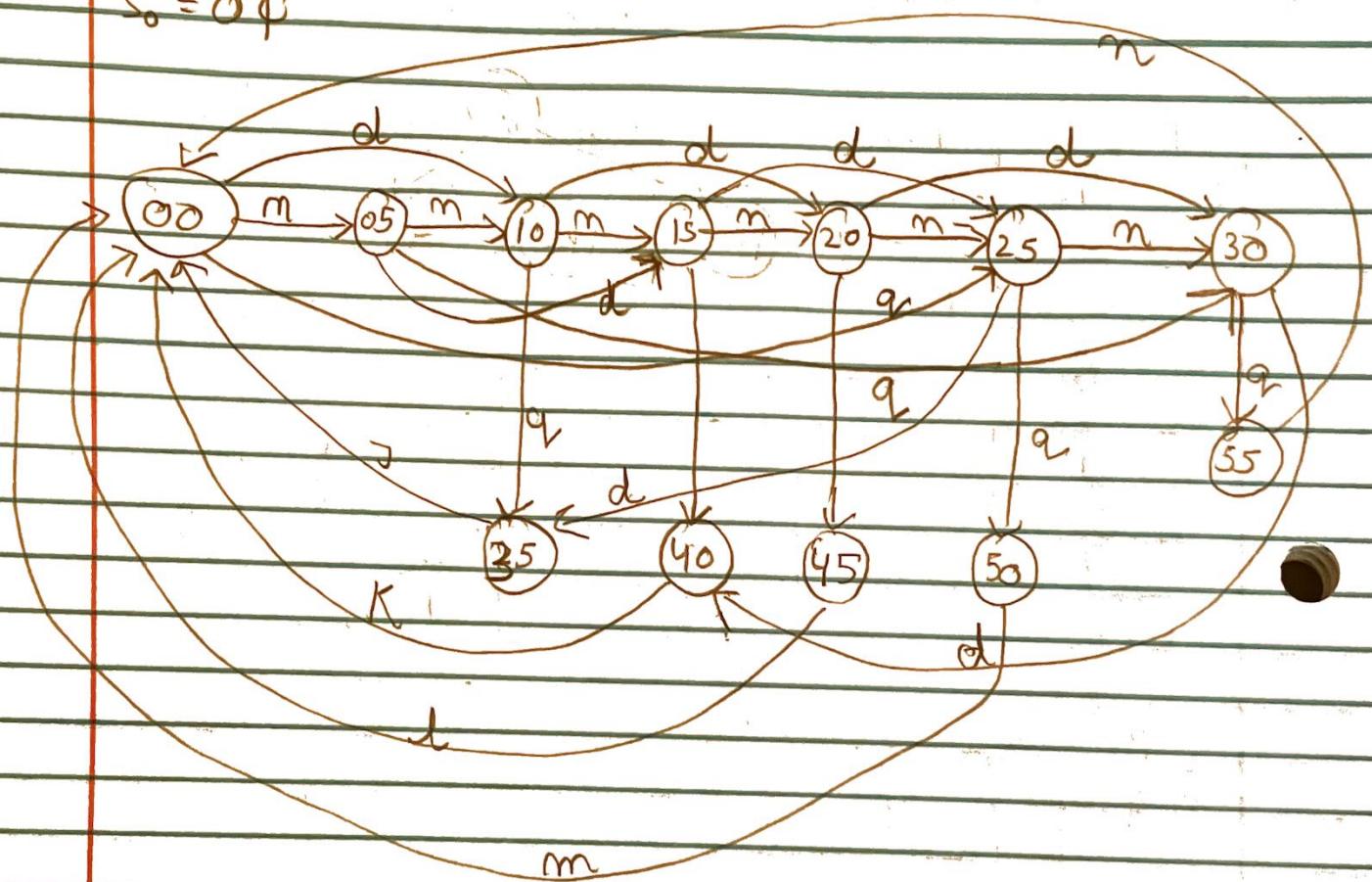
Input \rightarrow 5¢, 10¢, 25¢

nickel - 5¢

Output \rightarrow Soda & Return last item dime - 10¢

quarter = 25¢

$s_0 = 0¢$



m - nickel

d - dime

q - quarter

J \rightarrow Soda and nickel

K \rightarrow Soda and dime

L \rightarrow Soda, a nickel and a dime

M \rightarrow Soda and two dimes

N \rightarrow Soda and quarter

8)

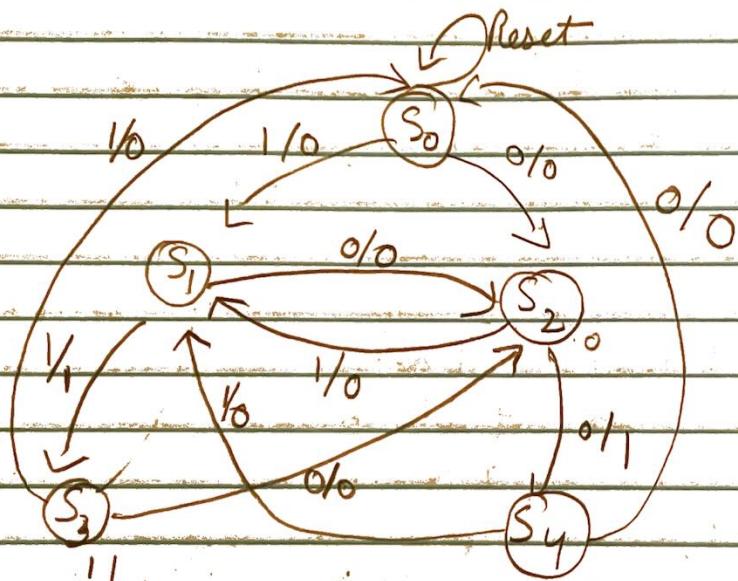
m ——————

— design

Input $\rightarrow m$

output \rightarrow True Wins $\rightarrow 2>1'r$

False Wins $\rightarrow 2>0'r$



$S_4 = \text{false wins}$

$S_3 = \text{True wins}$