ECCS1721-Homework#11

Problem 1

Using sequential (arbitrary) state assignment, realize the NRZ to Manchester code converter (described in lecture 27, slide 1) using D-Flip Flops.

Problem 2

Given the following state table:

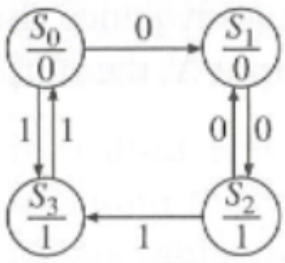
Current state	Next state		output
	W=0	W=1	
A	B	C	1
B	D	F	1
C	F	E	0
D	B	G	1
E	F	C	0
F	E	D	0
G	F	G	0

1. Minimize the state table.
2. Using heuristic rules, assign the right values for the states in the minimized state table.
3. Implement the minimized state table using Toggle Flip Flops.

1:

AB

S0 = 00
S1 = 01
S2 = 10
S3 = 11



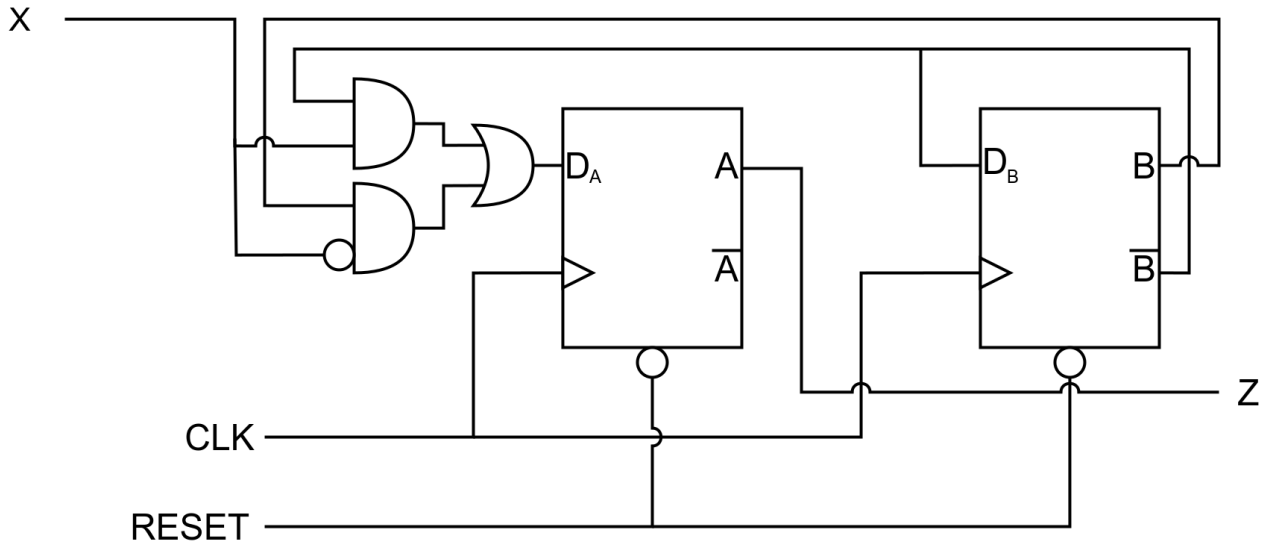
(b) State graph

Present State	Next State $X=0$	Next State $X=1$	Present Output (Z)
S_0	S_1	S_3	0
S_1	S_2	—	0
S_2	S_1	S_3	1
S_3	—	S_0	1

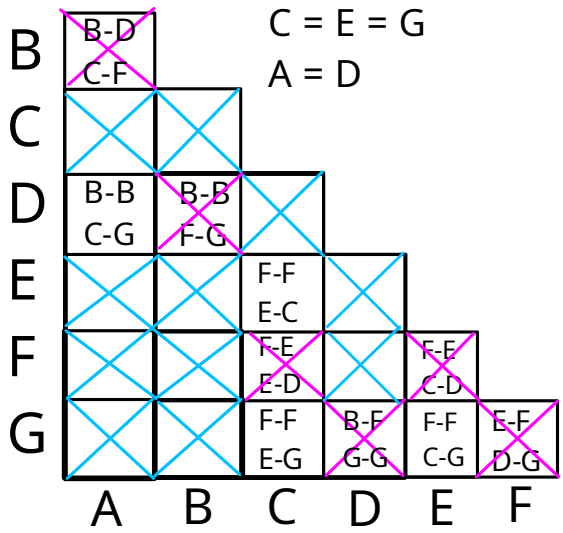
(c) State table

	X = 0		X = 1		
A^tB^t	$A^{t+1}B^{t+1}$	D_AD_B	$A^{t+1}B^{t+1}$	D_AD_B	Z
00	01	01	11	11	0
01	10	10	---	---	0
10	01	01	11	11	1
11	---	---	00	00	1

$$D_A = \overline{B}X + B\overline{X}$$
$$D_B = \overline{B}$$
$$Z = A$$



2.1:



C = E = G

A = D

Current State	Next State W = 0	Next State W = 1	Output (Z)
A	B	C	1
B	A	F	1
C	F	C	0
F	C	A	0

2.2:

Rule 1: (A,C)

Rule 2: (B,C) (A,F) (F, C) (C, A)

Rule 3: (A,B) (C,F)

Q2 \ Q1	0	1
0	A	C
1	F	B

00 = A

01 = F

10 = C

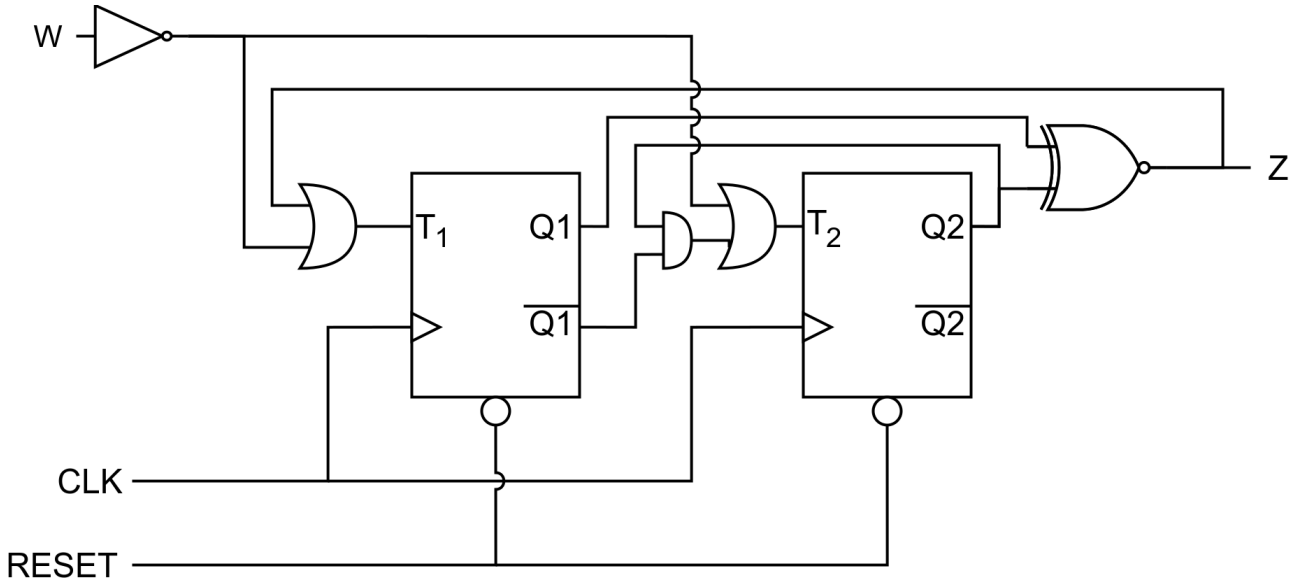
11 = B

	$Q_2^tQ_1^t$	$Q_1^{t+1}Q_2^{t+1}$ W = 0	$Q_1^{t+1}Q_2^{t+1}$ W = 1	Output (Z)
A:	00	11	10	1
C:	01	10	00	0
F:	10	01	10	0
B:	11	00	01	1

2.3:

	W = 0		W = 1		
$Q_2^tQ_1^t$	$Q_1^{t+1}Q_2^{t+1}$	T_1T_2	$Q_1^{t+1}Q_2^{t+1}$	T_1T_2	Output (Z)
00	11	11	10	10	1
01	10	11	00	01	0
10	01	11	10	00	0
11	00	11	01	10	1

$$T_1 = \overline{Q_1 \oplus Q_2} + \overline{W}$$
$$T_2 = \overline{Q_1}Q_2 + \overline{W}$$
$$Z = \overline{Q_1 \oplus Q_2}$$


W
Z
T_1
Q1
$\overline{Q1}$
T_2
Q2
$\overline{Q2}$
CLK
RESET