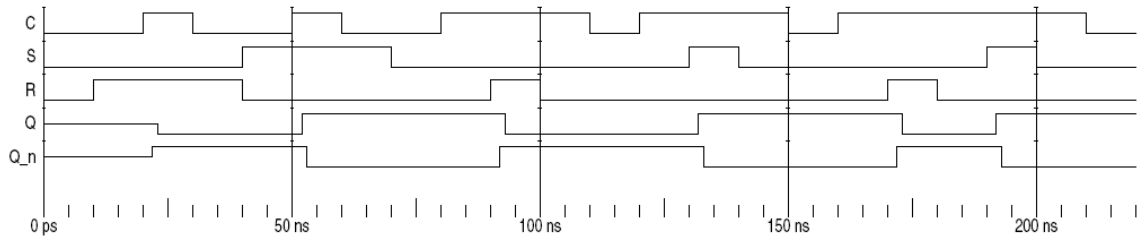
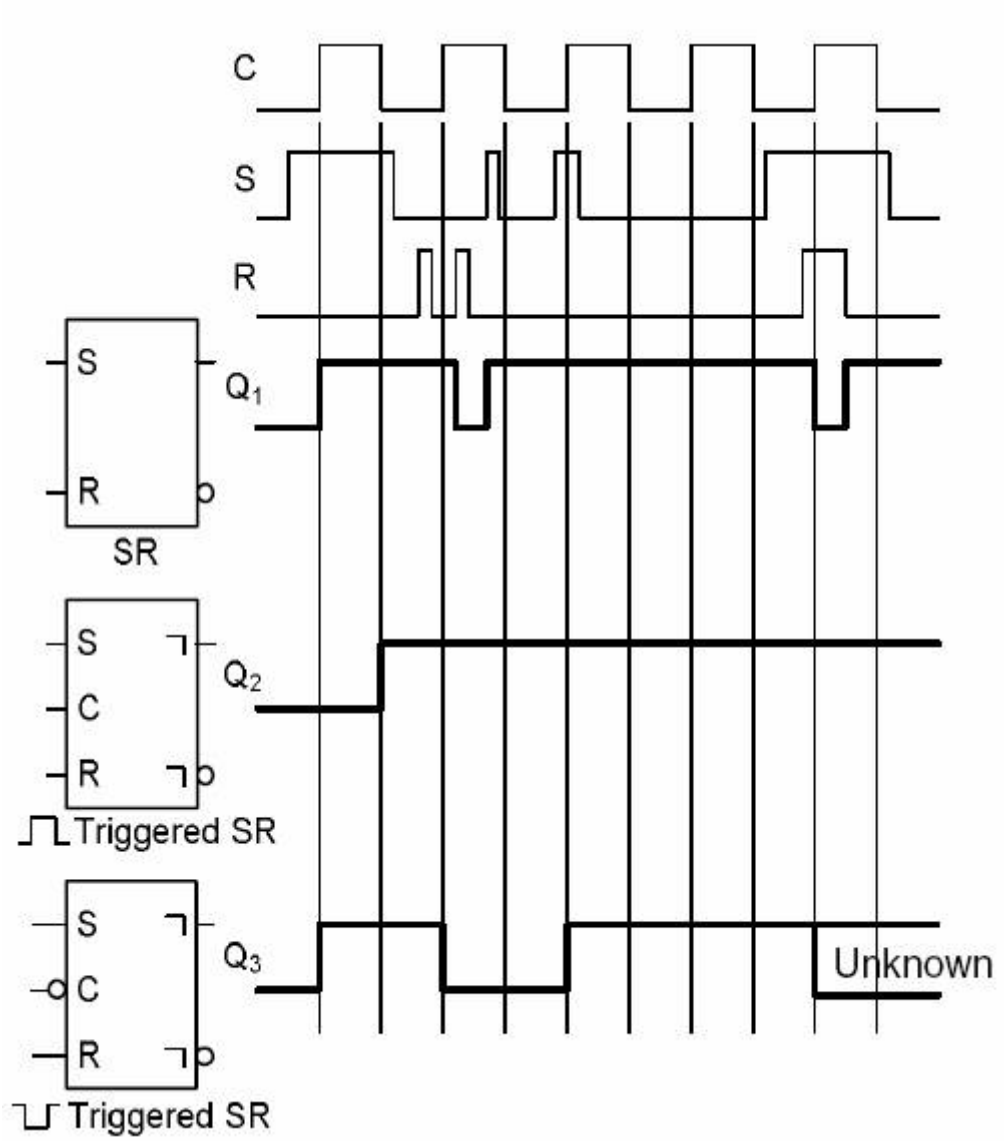
Homework 3 Solution

5-2.



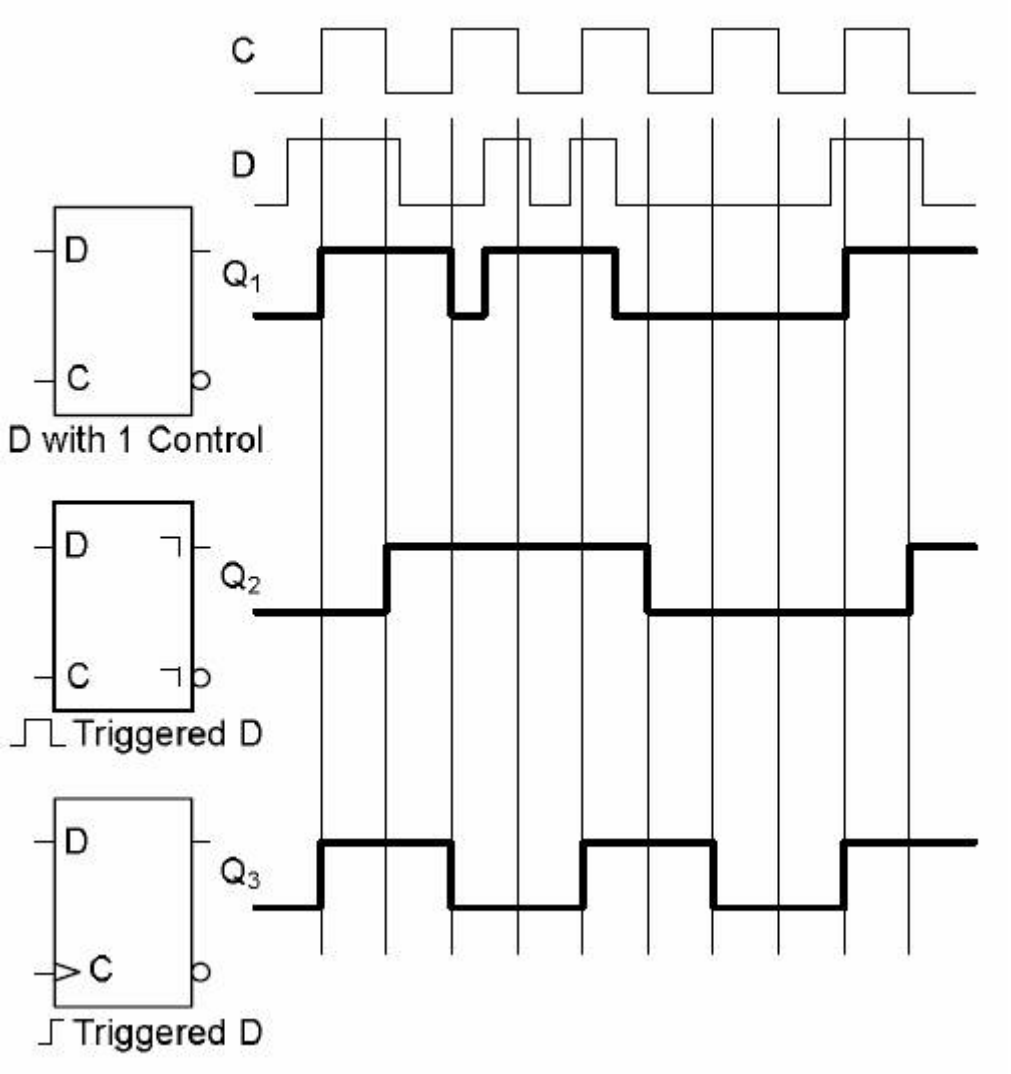
<2 marks>

5-4.



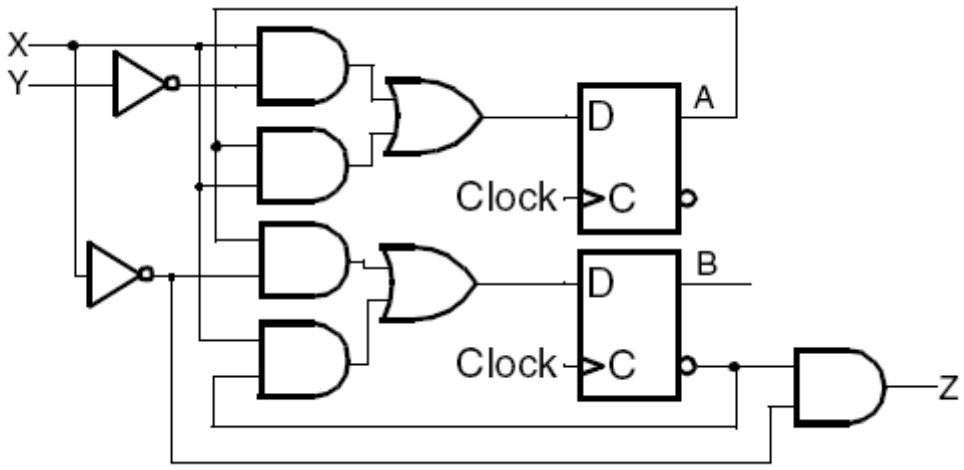
<3 marks>

5-5.

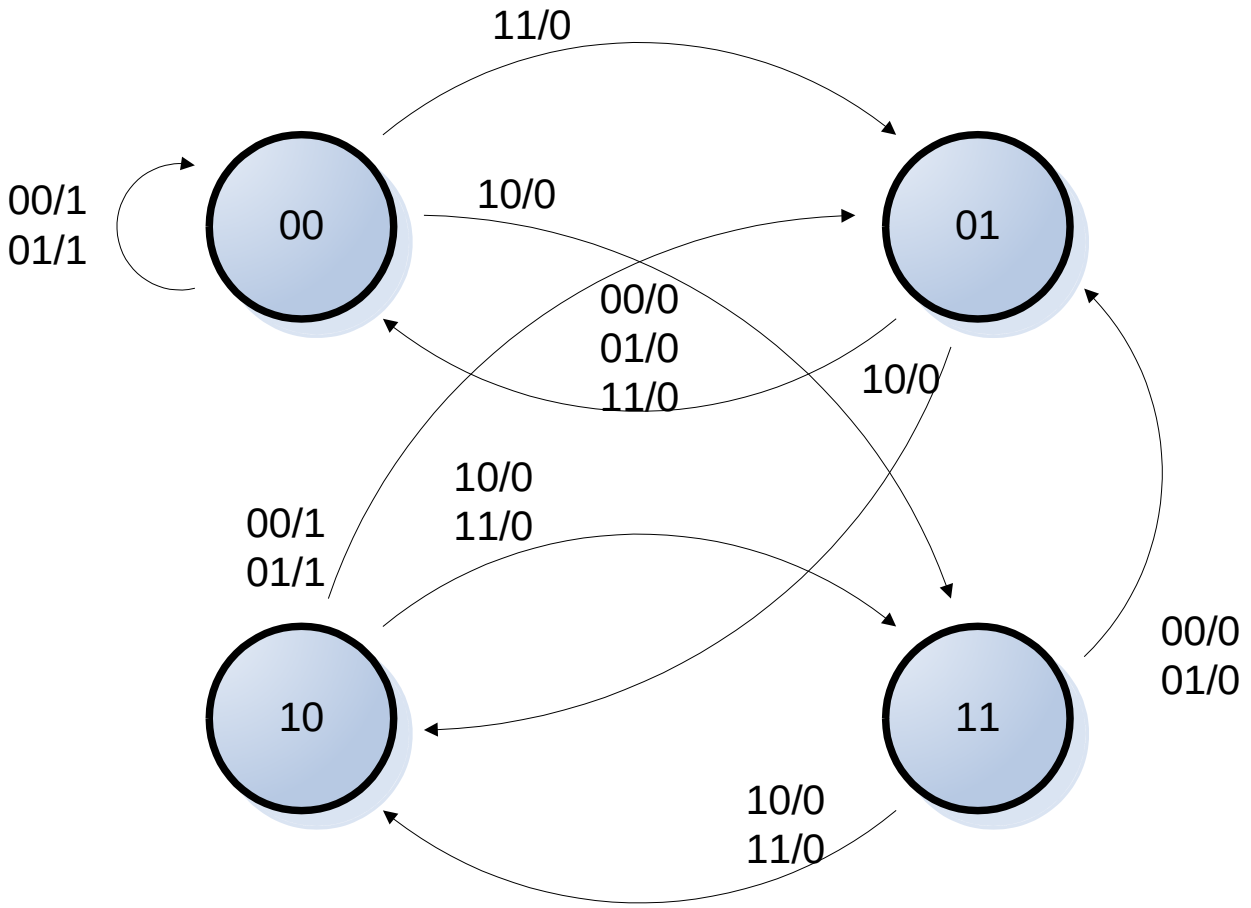

C
D
D
C
Q1
D with 1 Control
D
C
Q2
Triggered D
D
C
Q3
Triggered D

<3 marks>

5-6.


X
Y
D
C
A
Clock
D
C
B
Clock
Z

Present State		Inputs		Next State		Output
A	B	X	Y	A	B	Z
0	0	0	0	0	0	1
0	0	0	1	0	0	1
0	0	1	0	1	1	0
0	0	1	1	0	1	0
0	1	0	0	0	0	0
0	1	0	1	0	0	0
0	1	1	0	1	0	0
0	1	1	1	0	0	0
1	0	0	0	0	1	1
1	0	0	1	0	1	1
1	0	1	0	1	1	0
1	0	1	1	1	1	0
1	1	0	0	0	1	0
1	1	0	1	0	1	0
1	1	1	0	1	0	0
1	1	1	1	1	0	0



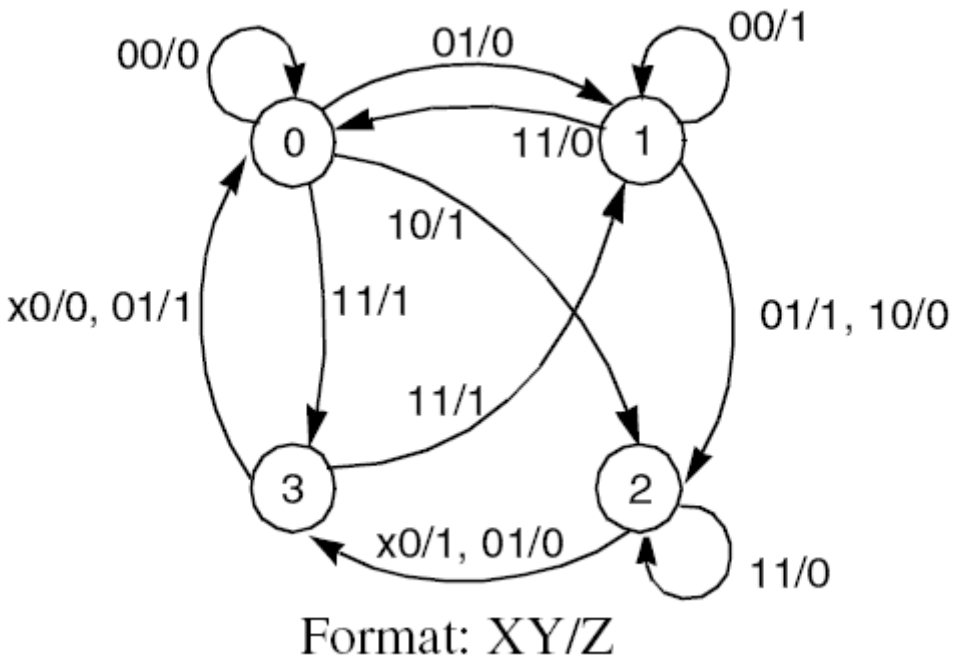
<3 marks>

5-9.

Present State	**00**	**00**	**01**	**00**	**01**	**11**	**00**	**00**	**01**	**11**	**00**
Input	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**1**
Output	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**
Next State	**00**	**01**	**00**	**01**	**11**	**00**	**00**	**01**	**11**	**00**	**01**

<2 marks>

5-10.



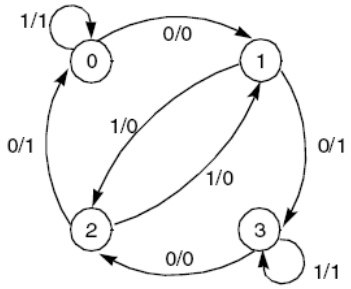
<2 marks>

5-11.

$S_A = B$ $\quad S_B = \overline{X \oplus A}$

$R_A = \overline{B}$ $\quad R_B = X \oplus A$

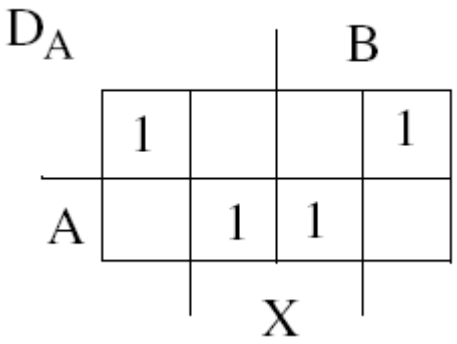
Present state		Input	Next state		Output
A	*B*	*X*	*A*	*B*	*Y*
0	0	0	0	1	0
0	0	1	0	0	1
0	1	0	1	1	1
0	1	1	1	0	0
1	0	0	0	0	1
1	0	1	0	1	0
1	1	0	1	0	0
1	1	1	1	1	1

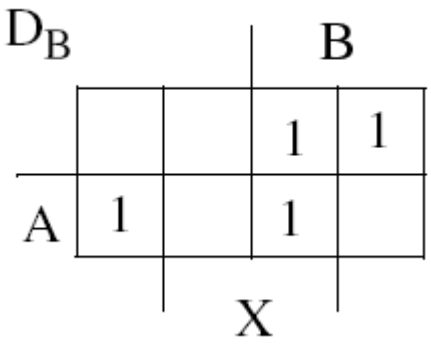


<2 marks>

5-13.

Present State		Input	Next State	
A	**B**	**X**	**A**	**B**
0	0	0	1	0
0	0	1	0	0
0	1	0	1	1
0	1	1	0	1
1	0	0	0	1
1	0	1	1	0
1	1	0	0	0
1	1	1	1	1





$D_A = A'X' + AX$ $D_B = A'B + BX + AB'X'$

<3 marks>

5-14.

There can be many alternatives for state assignment using 3-bit codes; one alternative is:

State	Code
A	000
B	001
C	010
D	100

The resulting state table is:

Present State	**Input**		**Next State**	**Output**
	X_1	**X_2**		**Z**
A 000	0	0	A 000	0
A 000	0	1	B 001	0
A 000	1	0	B 001	1
A 000	1	1	A 000	0
B 001	0	0	A 000	0
B 001	0	1	A 000	0
B 001	1	0	D 100	1
B 001	1	1	D 100	1
C 010	0	0	A 000	1
C 010	0	1	A 000	0
C 010	1	0	C 010	1
C 010	1	1	C 010	0
D 100	0	0	C 010	1
D 100	0	1	B 001	1
D 100	1	0	B 001	0
D 100	1	1	C 010	1

<2marks>