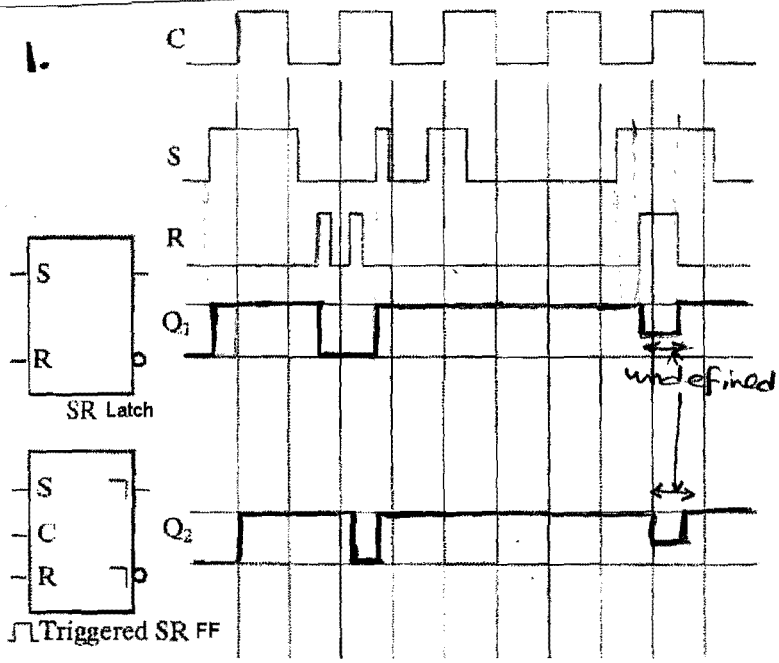
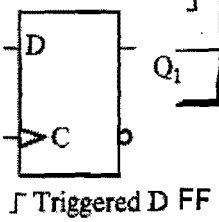
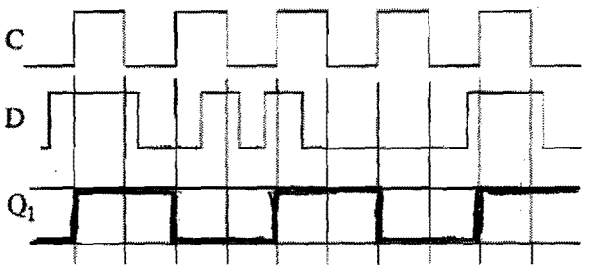
COE 202.03
Homework #7
Solutions

1.





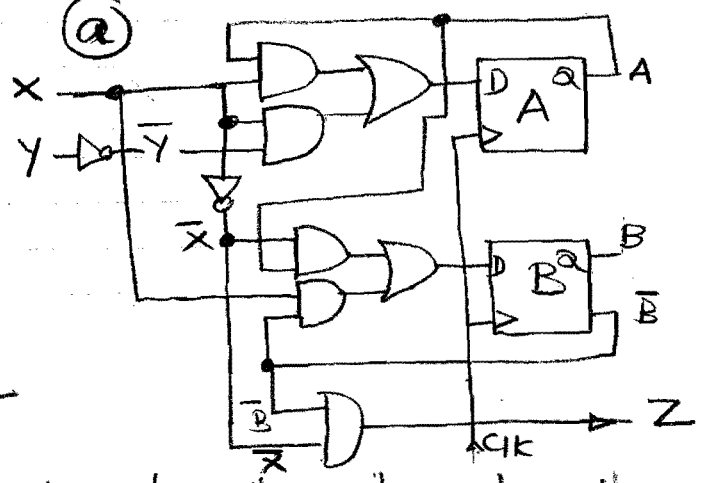


2. 5.6 in the textbook, page 299:

$$D_A = XA + X\bar{Y}$$

$$D_B = X\bar{B} + \bar{X}A$$

$$Z = \bar{X}\bar{B}$$



b. 1-D state table

I/ps

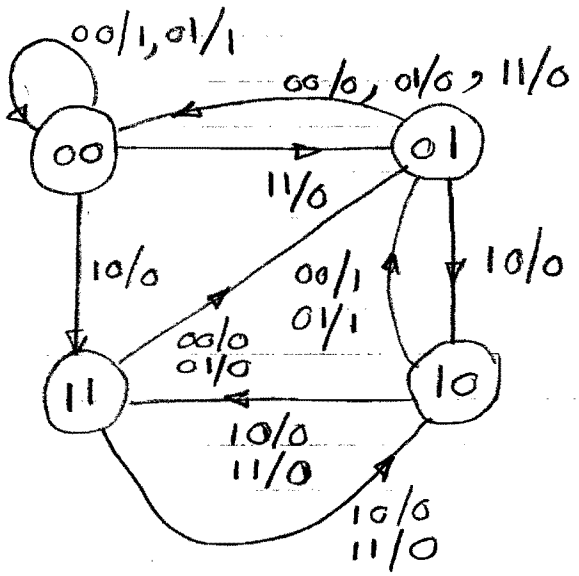
A	B	X	Y	XA	$X\bar{Y}$	D_A	$X\bar{B}$	$\bar{X}A$	D_B	$Z=\bar{X}\bar{B}$
0	0	0	0			0			0	1
0	0	0	1			0			0	1
0	0	1	0		1	1	1		1	0
0	0	1	1			0	1		1	0
0	1	0	0			0			0	0
0	1	0	1			0			0	0
0	1	1	0		1	1			0	0
0	1	1	1			0			0	0
1	0	0	0			0		1	1	1
1	0	0	1			0		1	1	1
1	0	1	0	1	1	1	1		1	0
1	0	1	1	1		1	1		1	0
1	1	0	0			0		1	1	0
1	1	0	1			0		1	1	0
1	1	1	0	1		1			0	0
1	1	1	1	1		1			0	0

2 contd, b.

2-D state table

Present state A(t) B(t)	Next state A(t+1) B(t+1) XY=00	XY=01	XY=10	XY=11	output Z=$\overline{X}\overline{B}$ XY=00	01	10	11
0 0	00	00	11	01	1	1	0	0
0 1	00	00	10	00	0	0	0	0
1 0	01	01	11	11	1	1	0	0
1 1	01	01	10	10	0	0	0	0

c.

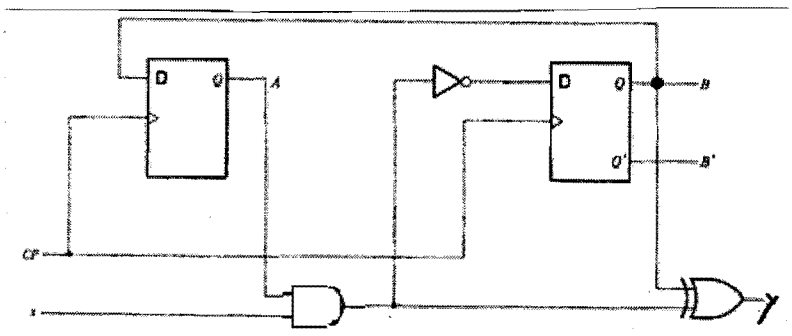


3.

$D_A = B$

$D_B = \overline{AX}$

$Y = AX \oplus B$



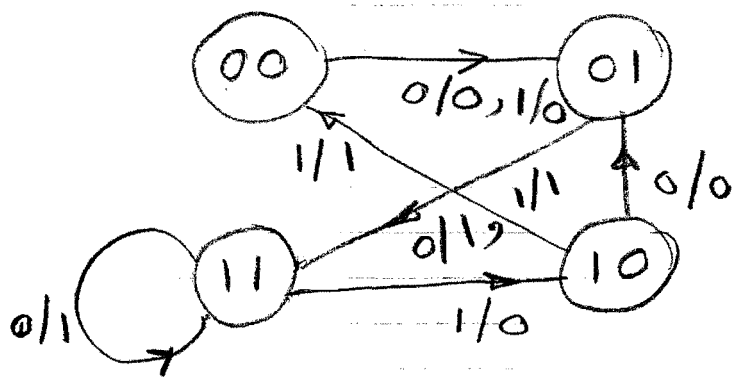
a. 1-D State Table

I/PS A	B	X	O/PS D_A	D_B	AX	$Y = AX \oplus B$
0	0	0	0	1	0	0
0	0	1	0	1	0	0
0	1	0	1	1	0	1
0	1	1	1	1	0	1
1	0	0	0	1	0	0
1	0	1	0	0	1	1
1	1	0	1	1	0	1
1	1	1	1	0	1	0

b. 2-D state table

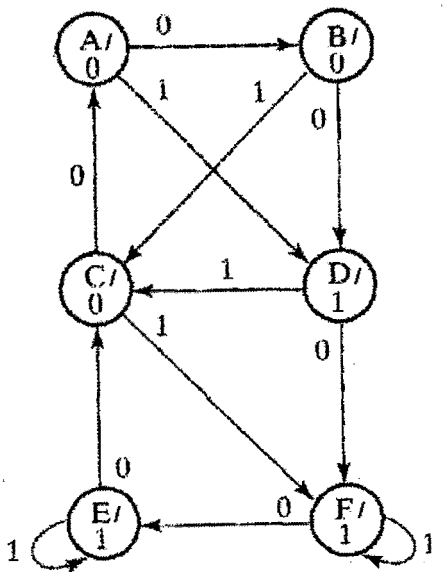
Present state A(t) B(t)	Next state A(t+1) B(t+1) X=0	Next state A(t+1) B(t+1) X=1	o/p Y X=0	o/p Y X=1
0 0	0 1	0 1	0	0
0 1	1 1	1 1	1	1
1 0	0 1	0 0	0	1
1 1	1 1	1 0	1	0

c. State Diagram



4.

a. Moore (External o/p tied to state) – does not depend on I/p



b. 6 states, 3 FFs, 1 external I/p
1 = o/p

c. 2-D Table

Present state	Next state I/p = 0	Next state I/p = 1	o/p
A	B	D	0
B	D	C	0
C	A	F	0
D	F	C	1
E	C	E	1
F	E	F	1

- 1-D Table

Present state	I/p	Next State	O/p
A	0	B	0
A	1	D	0
B	0	D	0
B	1	C	0
C	0	A	0
C	1	F	0
D	0	C	1
D	1	E	1
E	0	E	1
E	1	F	1
F	0	F	1
F	1		

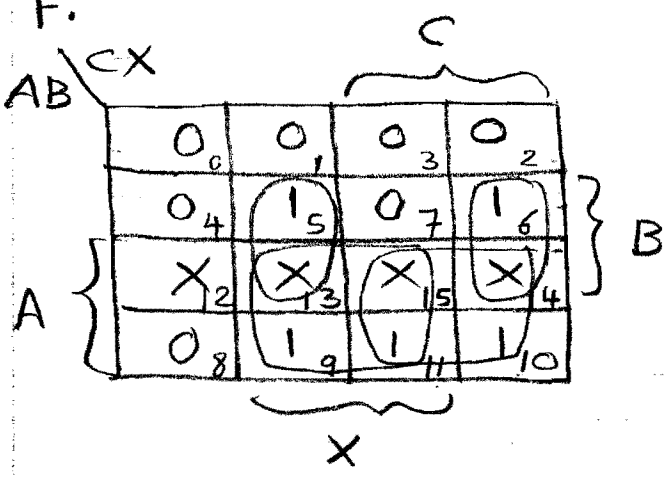
e. A = 000 B = 001 C = 010

D = 011 E = 100 F = 101

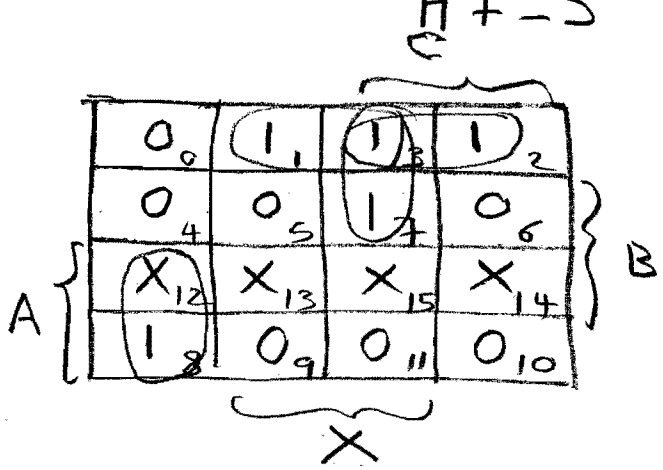
We need 3 FFS $\rightarrow 2^3 = 8$ states, we use 6 out of these 8 states giving.

FFS → Index	Present state A_t B_t C_t	I/p X	Next State A_{t+1} B_{t+1} C_{t+1}	O/p Y
			D_A D_B D_C	
0	0 0 0	0	0 0 1	0
1	0 0 0	1	0 1 1	0
2	0 0 1	0	0 1 1	0
3	0 0 1	1	0 1 0	0
4	0 1 0	0	0 0 0	0
5	0 1 0	1	1 0 1	0
6	0 1 1	0	1 0 1	1
7	0 1 1	1	0 1 0	1
8	1 0 0	0	0 1 0	1
9	1 0 0	1	0 1 0	1
10	1 0 1	0	1 0 0	1
11	1 0 1	1	1 0 1	1
12	1 1 0	0	X X X	X
13	1 1 0	1	X X X	X
14	1 1 1	0	X X X	X
15	1 1 1	1	X X X	X

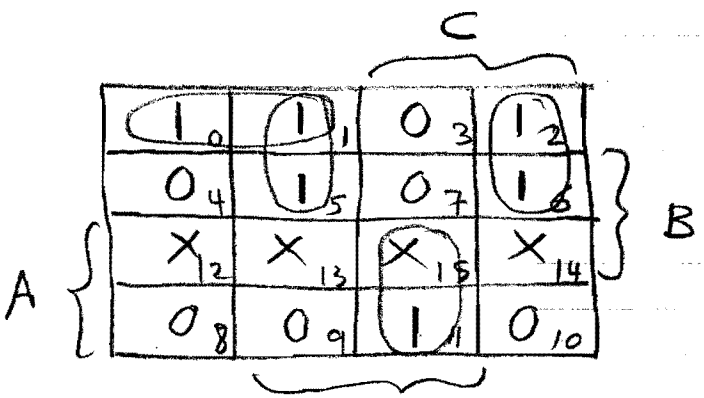
F.



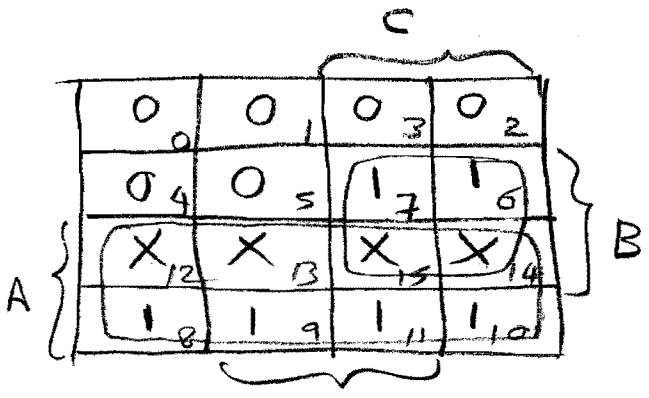
D_A map



D_B map



D_C map



Y map

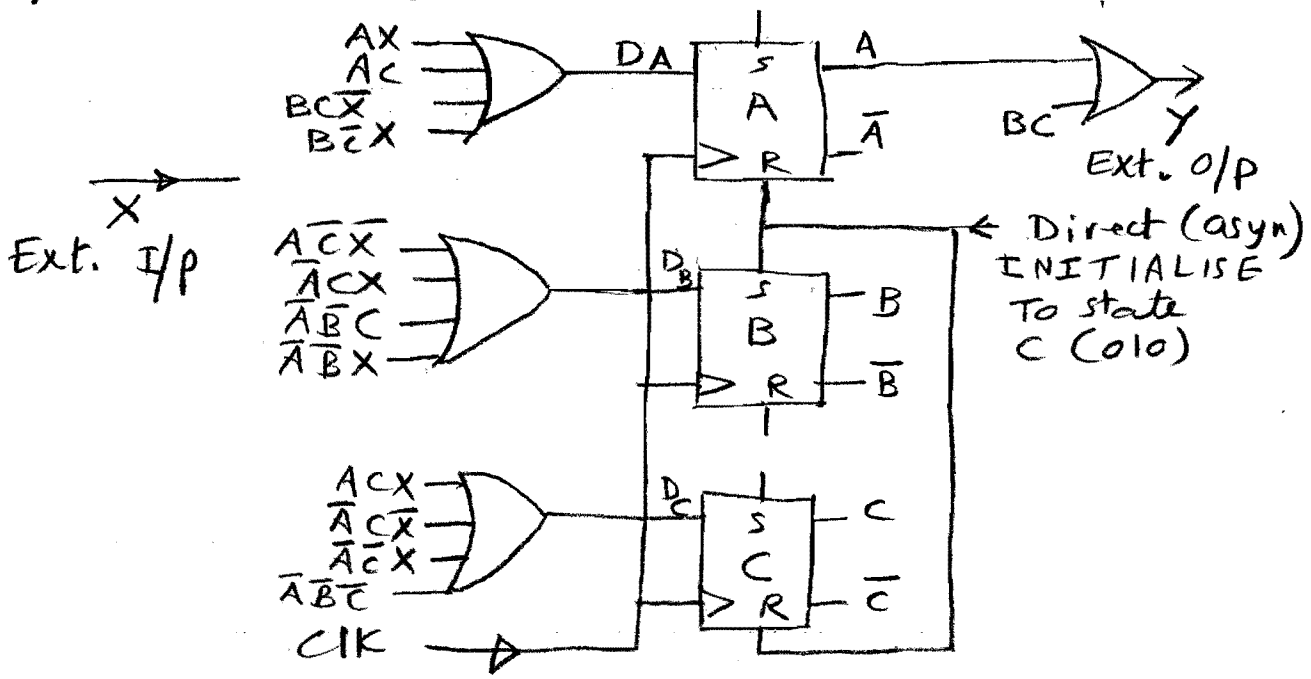
$$D_A = AX + AC + BC\bar{X} + B\bar{C}X$$

$$D_B = A\bar{C}\bar{X} + \bar{A}CX + \bar{A}\bar{B}C + \bar{A}\bar{B}X$$

$$D_C = ACX + \bar{A}C\bar{X} + \bar{A}\bar{C}X + \bar{A}\bar{B}\bar{C}$$

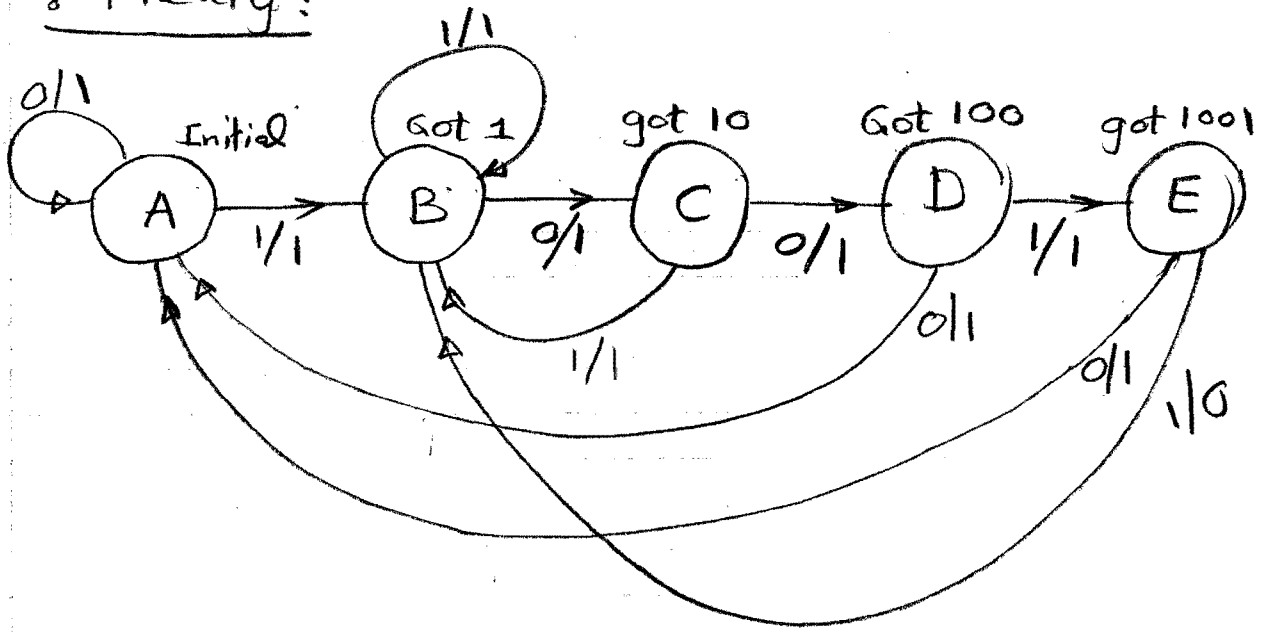
$$Y = A + BC$$

g.



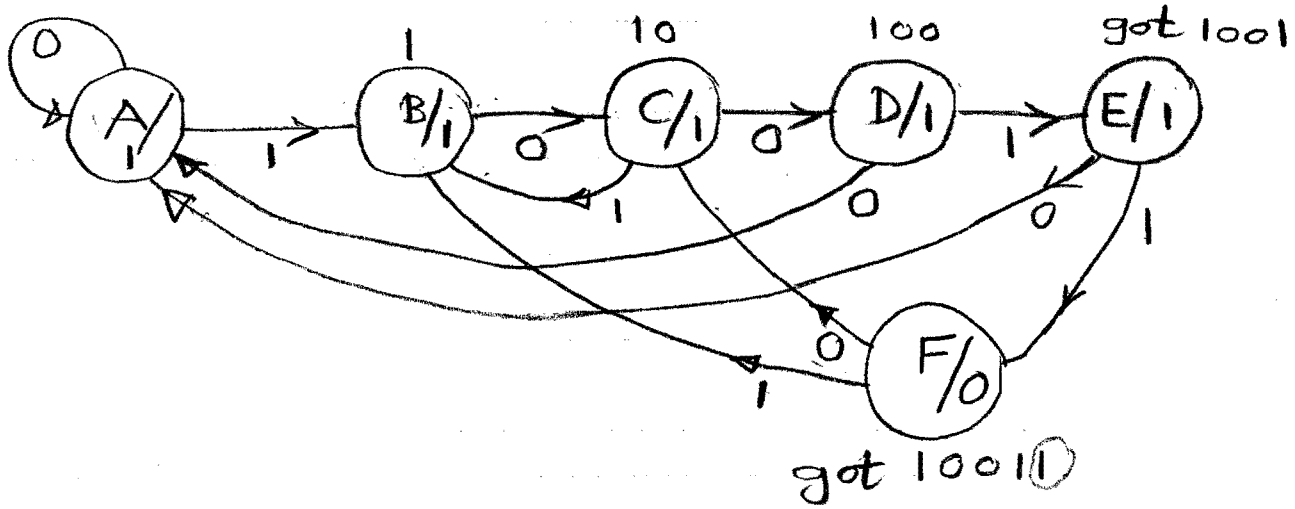
5. I/p sequence to be detected is 10011

- Mealy:



# of states = 5
# of FFs = 3
# of state variables = 3

- Moore



# of states = 6

# of FFs = 3

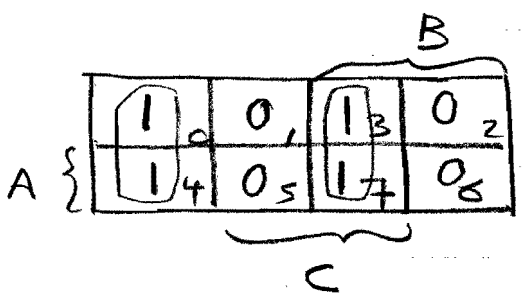
# of state variables = 3

6.

a.

Present state				Next state		
Index	A_t	B_t	C_t	A_{t+1} (D_A)	B_{t+1} (D_B)	C_{t+1} (D_C)
7	1	1	1	1	0	1
6	1	1	0	1	0	0
5	1	0	1	1	0	0
4	1	0	0	0	1	1
3	0	1	1	0	1	0
2	0	1	0	0	0	1
1	0	0	1	0	0	0
0	0	0	0	1	1	1

b.



D_B map

$$D_B = BC + \overline{B}\,\overline{C}$$