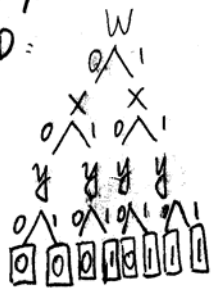
Homework 7
Solutions

(A) $f(w, x, y) = wx + xy + wy$

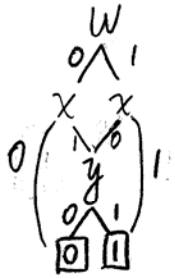
(i) $w < x < y$

Complete BDD:



$\Rightarrow$

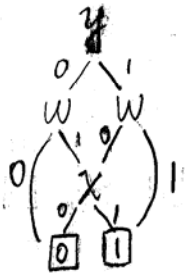
Reduced BDD:



(ii) $y < w < x$

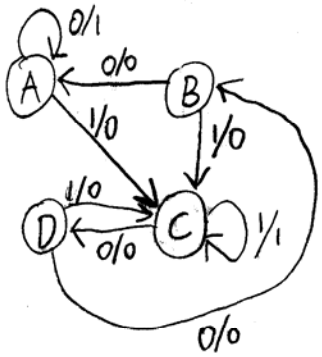
Since the function f is a <u>majority function</u>, this BDD should appear in the same form as in (i)

Reduced BDD:

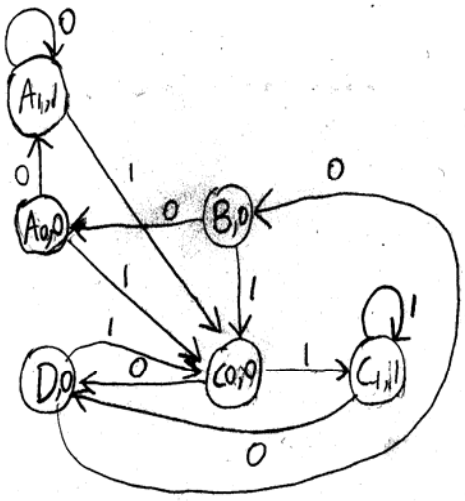


(B)

(i) State-Transition Diagram:



(ii) State-Transition Diagram of the Equivalent Moore-Machine:



(iii) Yes. You should get the same Mealey machine as in part (i).

Demostrante =

	0	1
A0	A1,1	C0,0
A1	A1,1	C0,0
B	A0,0	C0,0
C0	D0,0	C1,1
C1	D0,0	C1,1
D	B,0	C0,0

$(A0, A1)_1 (B, D)_2 (C0, C1)_3$

[13] [13] [13] [23] [23] [23]

$\Downarrow$

$\overbrace{(A0, A1)}^{A}{}_1 (B)_2 (D)_3 \overbrace{(C0, C1)}^{C}{}_4$

[14] [14] [14] [24] [34] [34]

Construct table for reduced machine:

	0	1
A	A,1	C,0
B	A,0	C,0
C	D,0	C,1
D	B,0	C,0

equivalent to the Mealey machine in part (i)

(c) Based on outputs, divide up the states:

$(1\ 3\ 4)_1, (2\ 6\ 7\ 8)_2\ (5)_3$

next states: $1 \to [2\ 3\ 1\ 1]$ $3 \to [2\ 3\ 1\ 1]$ $4 \to [2\ 3\ 1\ 1]$

$2 \to [1\ 2\ 1\ 3]$ $6 \to [1\ 2\ 1\ 3]$ $7 \to [1\ 2\ 1\ 3]$ $8 \to [1\ 2\ 1\ 1]$

$5 \to [2\ 3\ 1\ 2]$ needs to divide $(2\ 6\ 7\ 8)$ into $(2\ 6\ 7)\ (8)$

$\Rightarrow (1\ 3\ 4)_1\ (2\ 6\ 7)_2\ (8)_3\ (5)_4$

next states: $1 \to [2\ 4\ 1\ 1]$ $3 \to [2\ 4\ 1\ 1]$ $4 \to [2\ 4\ 1\ 1]$

$2 \to [1\ 3\ 1\ 4]$ $6 \to [1\ 3\ 1\ 4]$ $7 \to [1\ 2\ 1\ 4]$ $8 \to [1\ 2\ 1\ 1]$

$5 \to [2\ 4\ 1\ 2]$ needs to divide $(2\ 6\ 7)$ into $(2\ 6)(7)$

$\Rightarrow (1\ 3\ 4)_1\ (2\ 6)_2\ (7)_3\ (8)_4\ (5)_5$

next states: $1 \to [2\ 5\ 1\ 1]$ $3 \to [2\ 5\ 1\ 1]$ $4 \to [2\ 5\ 1\ 1]$

$2 \to [1\ 4\ 1\ 5]$ $6 \to [1\ 4\ 1\ 5]$ $7 \to [1\ 2\ 1\ 5]$ $8 \to [1\ 2\ 1\ 1]$ $5 \to [2\ 5\ 1\ 3]$

Hence the new table is

	00	01	11	10
1	2,0	5,1	1,1	1,0
2	1,1	4,0	1,1	5,1
3	1,1	2,0	1,1	5,1
4	1,1	2,0	1,1	1,1
5	2,1	5,1	1,0	3,0

next state, output

(D)

machine 1	0	1
A	B, 0	C, 0
B	C, 1	B, 0
C	B, 1	C, 0
machine 2		
D	F, 1	D, 0
E	F, 0	D, 0
F	D, 1	F, 0
G	D, 0	F, 0

$(AEG)_1 (BCDF)_2$

$A=[22]\ E=[22]\ G=[22]$

$B=[22]\ C=[22]\ D=[22]\ F=[22]$

⇓

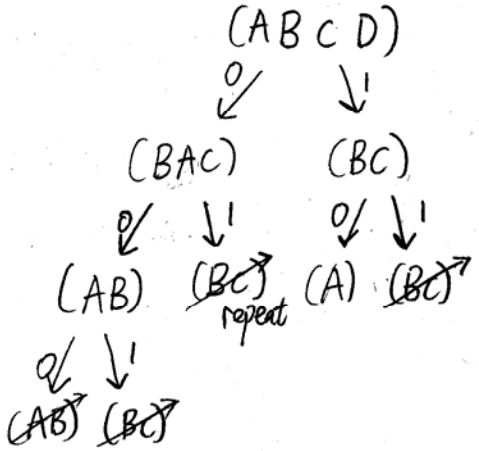
$(AEG)\ (BCDF)$ (no change)

$A \equiv E, G$; $B \equiv D, F$; $C \equiv D, F$ ⇒ Machine 1 ⊆ Machine 2

$D \equiv B, C$; $E \equiv A$; $F \equiv B, C$; $G \equiv A$ ⇒ Machine 2 ⊆ Machine 1

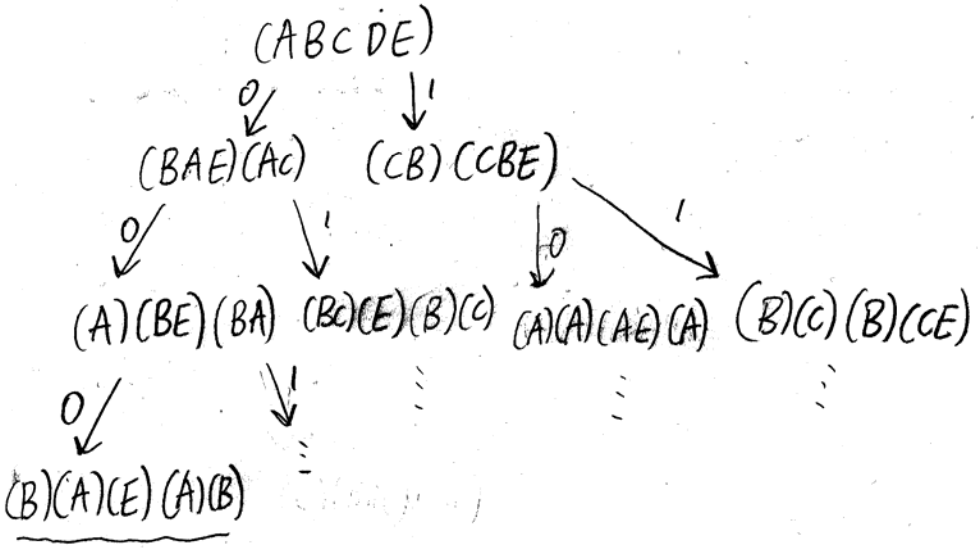
⇒ The two machines are equivalent

(E)



So the synchronizing sequence for this machine is <u>10</u>

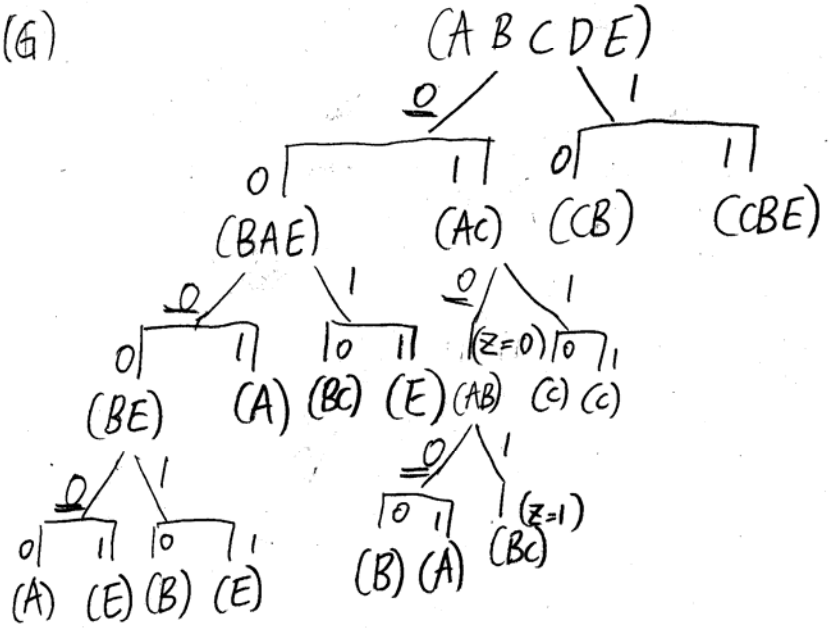
(E)



"000" is a distinguishing sequence

There are more than one correct answer for the question.

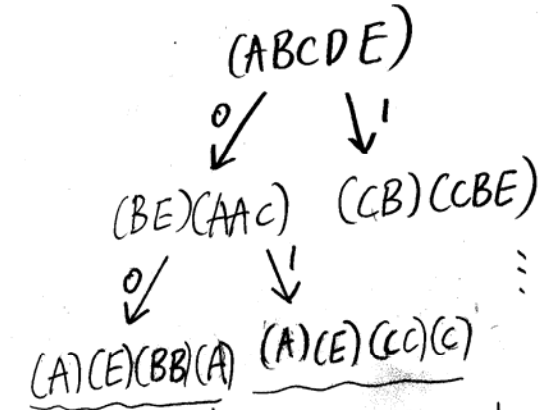
(G)



Can see that "000" is a distinguishing sequence

Again, there are more than one correct answer

(H)



"00" is also a homing sequence "01" is a homing sequence

Input sequence "01"

	output	final state
A	00	A
B	10	C
C	10	C
D	11	C
E	01	E

There are more than 1 correct answer