

# Tugas Mandiri 6

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Kelas: PSD - C

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$$①. A(t+1) = (A(t).B(t))' \oplus (x(t) + A(t))$$

$$B(t+1) = B(t).A(t) + x(t)'$$

$$Y(t) = A(t) \oplus B(t) \oplus x(t)$$

a. One-dimension

Current State		input	Next state		Output
A(t)	B(t)	x(t)	A(t)'	B(t)'	Y
0	0	0	1	1	0
0	0	1	0	0	1
0	1	0	1	1	1
0	1	1	0	0	0
1	0	0	0	1	1
1	0	1	0	0	0
1	1	0	1	1	0
1	1	1	1	1	1

b. Two dimension

Current State		Next State				Output	
		x=0		x=1		x=0	x=1
A(t)	B(t)	A(t)'	B(t)'	A(t)'	B(t)'	Y	Y
0	0	1	1	0	0	0	1
0	1	1	1	0	0	1	0
1	0	0	1	0	0	1	0
1	1	1	1	1	1	0	1

c. a. D Flip Flop

Clock	D	Q(t)	Q(t+1)	Karakteristik	
↑	0	0	0	D=0	Pada saat clock high dan D=0, Q(t+1) = Reset to 0
↑	0	1	0		
↑	1	0	1	D=1	Pada saat clock high dan D=1, Q(t+1) = Set to 1
↑	1	1	1		



b. SR Flip-flop

Clock	S	R	Q(t)	Q(t+1)	Karakteristik
↑	0	0	0	0	S=0, Saat clock high dan S=0, R=0,
↑	0	0	1	1	R=0, Q(t+1)=Q(t) atau remember Q(t)
↑	0	1	0	0	S=0, Saat clock high dan S=0, R=1
↑	0	1	1	0	Q(t+1)=0 atau reset ke 0
↑	1	0	0	1	S=1, Saat clock high dan S=1, R=0,
↑	1	0	1	1	R=0, Q(t+1)=1 atau set ke 1

State Tab

Present

A B

0 0

0 0

0 1

0 1

1 0

1 1

1 1

1 1

x

c. T flip flop

Clock	T	Q(t)	Q(t+1)	Karakteristik
↑	0	0	0	T=0, Saat clock high dan T=0, Q(t+1)=Q(t) karena Q(t+1)=Q(t) ⊕ 0
↑	0	1	1	
↑	1	0	1	T=1, Saat clock high dan T=1, Q(t+1)=Q̄(t) karena Q(t+1)=Q(t) ⊕ 1
↑	1	1	0	

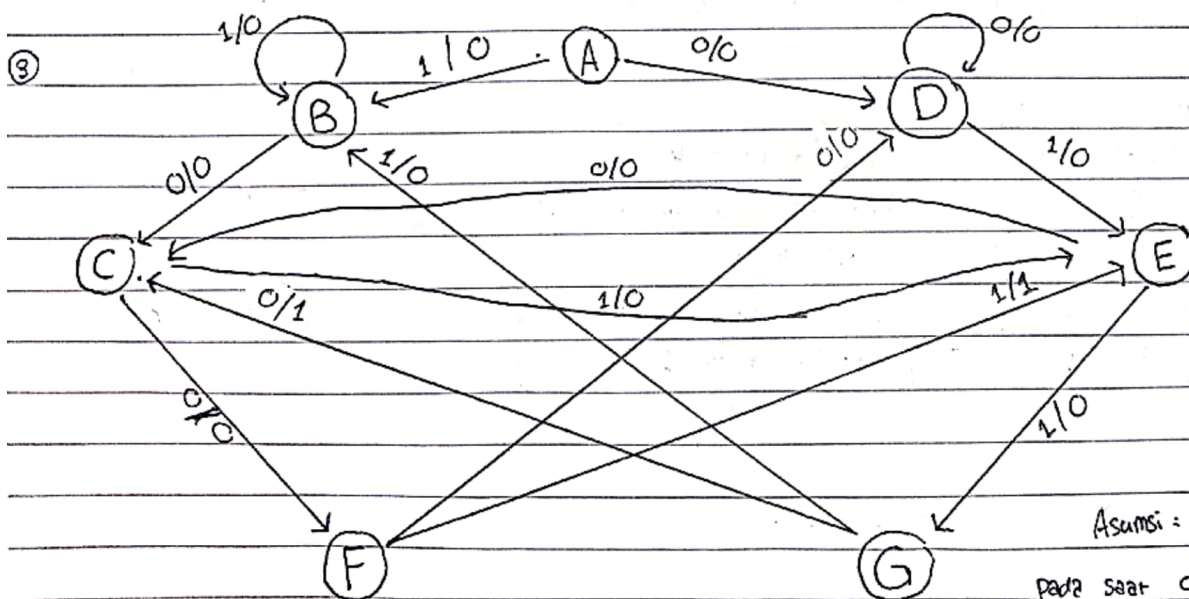
Prose

Present

A

d. JK Flip flop

Clock	J	K	Q(t)	Q(t+1)	Karakteristik
↑	0	0	0	0	J=0, Saat clock high dan J=0, K=0, Q(t+1)=Q(t) atau remember Q(t)
↑	0	0	1	1	
↑	0	1	0	0	J=0, Saat clock high dan J=0 dan K=1, Q(t+1)=0 atau reset ke 0
↑	0	1	1	0	
↑	1	0	0	1	J=1, Saat clock high dan J=1 dan K=0, Q(t+1)=1 atau set ke 1
↑	1	0	1	1	
↑	1	1	0	1	J=1, Saat clock high dan J=1, K=1, Q(t+1)=Q̄(t) atau toggle Q(t)
↑	1	1	1	0	



Asumsi: output 1 berarti  
 pada saat clock itu juga, telah  
 menunggu, clock lanjutan





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State Table

	Present State			Next State						Output	
				x=0			x=1			x=0	x=1
	A	B	C	A'	B'	C'	A'	B'	C'	Y	Y
A	0	0	0	0	1	1	0	0	1	0	0
B	0	0	1	0	1	0	0	0	1	0	0
C	0	1	0	1	0	1	1	0	0	0	0
D	0	1	1	0	1	1	1	0	0	0	0
E	1	0	0	0	1	0	1	1	0	0	0
F	1	0	1	0	1	1	1	0	0	0	1
G	1	1	0	0	1	0	0	0	1	1	0
	x	x	x	x	x	x	x	x	x	x	x

Prosedur design

	Present State			Next State						Output	
				x=0			x=1			x=0	x=1
	A	B	C	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	Y	Y
A	0	0	0	0	1	1	0	0	1	0	0
B	0	0	1	0	1	0	0	0	1	0	0
C	0	1	0	1	0	1	1	0	0	0	0
D	0	1	1	0	1	1	1	0	0	0	0
E	1	0	0	0	1	0	1	1	0	0	0
F	1	0	1	0	1	1	1	0	0	0	1
G	1	1	0	0	1	0	0	0	1	1	0
	x	x	x	x	x	x	x	x	x	x	x

Optimization

**D<sub>2</sub>**

B'	B
0 <sup>0</sup>	0 <sup>1</sup>
0 <sup>4</sup>	0 <sup>5</sup>
1 <sup>12</sup>	1 <sup>13</sup>
0 <sup>8</sup>	0 <sup>9</sup>

$D_2 = A'BC' + xA'B + xAB'$   
 $\Rightarrow A'B(c' + x) + xAB'$

**D<sub>1</sub>**

B'	B
1 <sup>0</sup>	1 <sup>1</sup>
1 <sup>4</sup>	1 <sup>5</sup>
1 <sup>12</sup>	0 <sup>13</sup>
0 <sup>8</sup>	0 <sup>9</sup>

$D_1 = xB' + x'C + x'A + AB'C$   
 $\Rightarrow x'(A+B+C) + AB'C$

**D<sub>0</sub>**

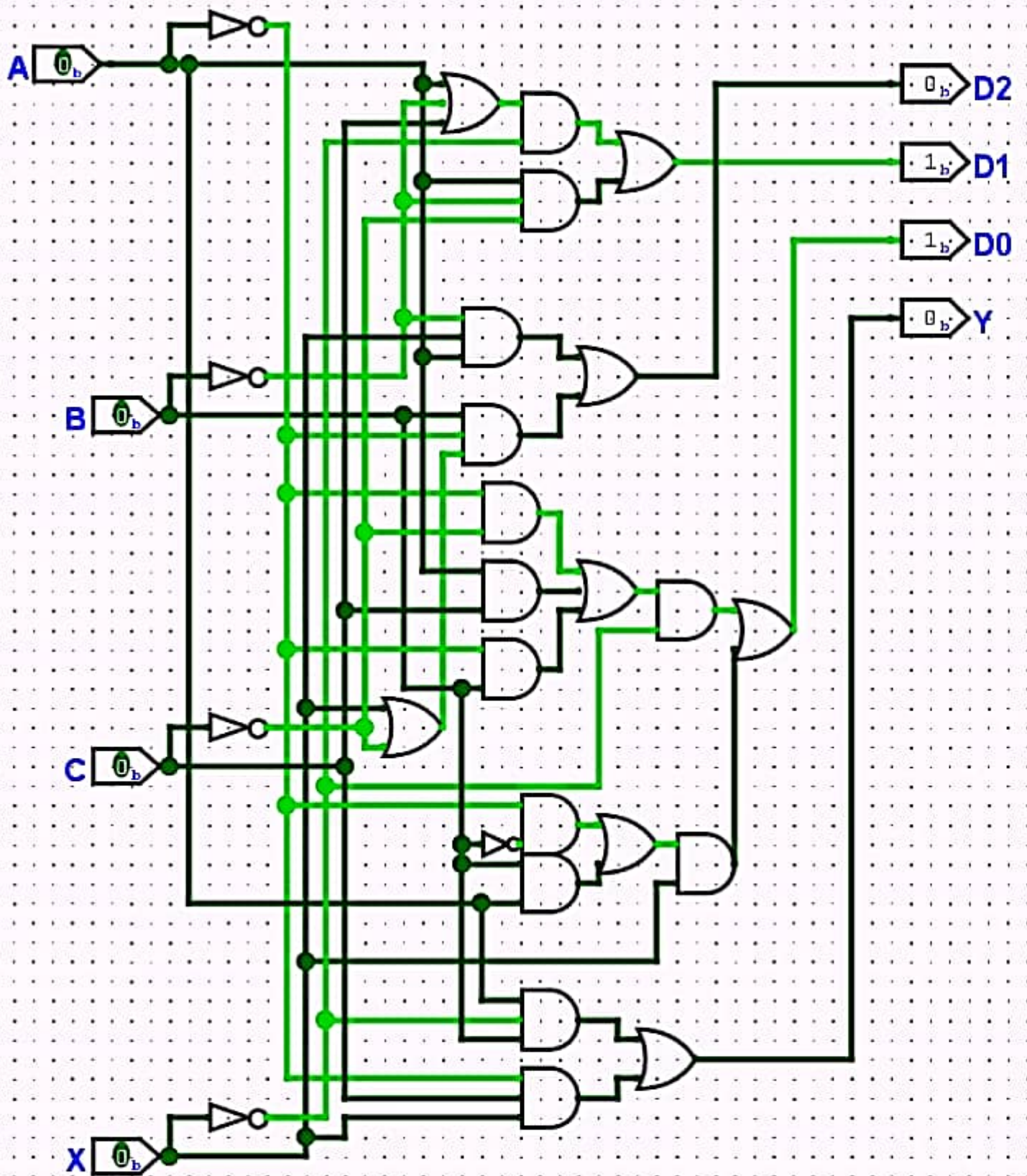
B'	B
1 <sup>0</sup>	1 <sup>1</sup>
0 <sup>4</sup>	1 <sup>5</sup>
0 <sup>12</sup>	0 <sup>13</sup>
1 <sup>8</sup>	1 <sup>9</sup>

$D_0 = x'A'C' + x'A'B + x'AC + xAB + xA'B'$   
 $\Rightarrow x'(A'C' + AC) + x(AB + A'B') + x'A'B$   
 $\Rightarrow x'(A'C' + AC + A'B) + x'(AB + A'B')$

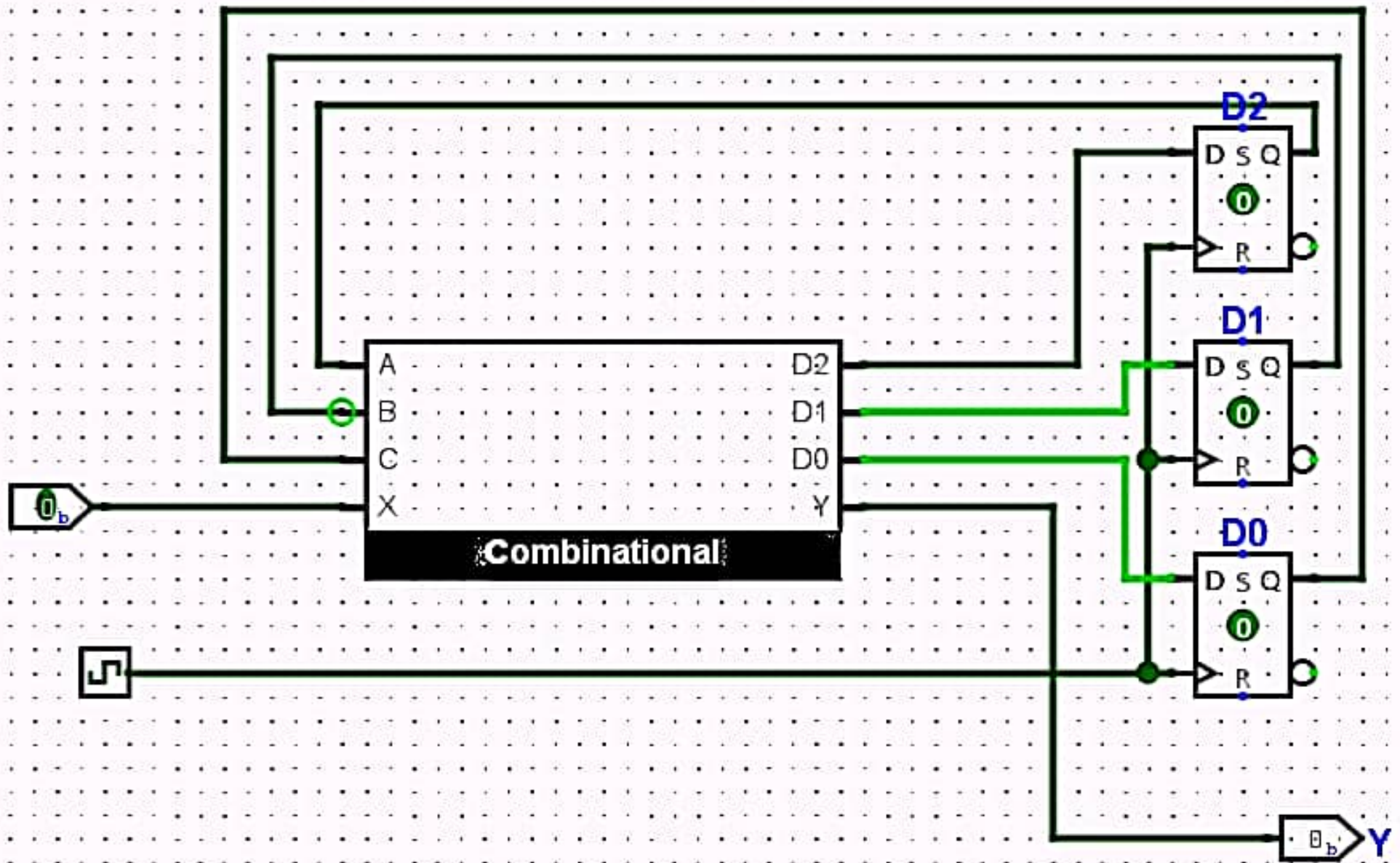
**Y**

B'	B
0 <sup>0</sup>	0 <sup>1</sup>
0 <sup>4</sup>	0 <sup>5</sup>
0 <sup>12</sup>	1 <sup>13</sup>
0 <sup>8</sup>	0 <sup>9</sup>

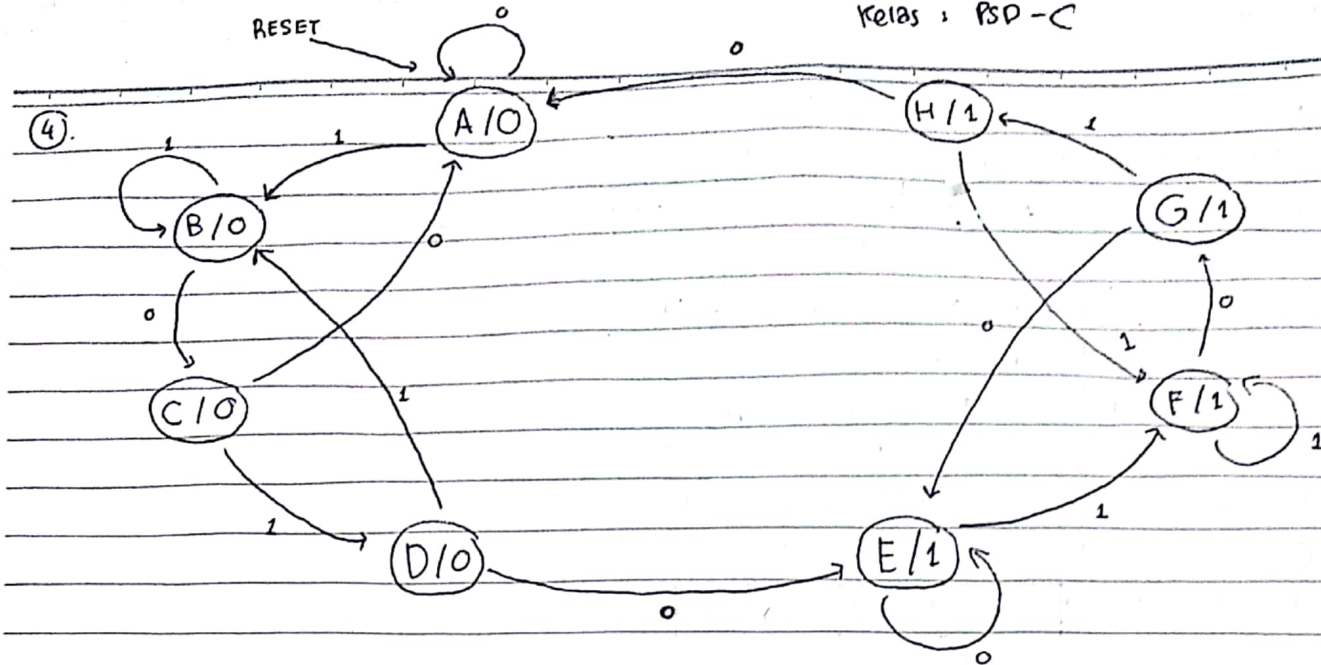
$Y = \bar{x} \cdot A \cdot B + x \cdot A' \cdot C$







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State table

	Present State			Next State						Output
	A	B	C	x = 0			x = 1			
A <sup>+</sup>				B <sup>+</sup>	C <sup>+</sup>	A <sup>+</sup>	B <sup>+</sup>	C <sup>+</sup>	Y	
A	0	0	0	0	0	0	0	0	1	0
B	0	0	1	0	1	0	0	0	1	0
C	0	1	0	0	0	0	0	1	1	0
D	0	1	1	1	0	0	0	0	1	0
E	1	0	0	1	0	0	1	0	1	1
F	1	0	1	1	1	0	1	0	1	1
G	1	1	0	1	0	0	1	1	1	1
H	1	1	1	0	0	0	1	0	1	1

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Present State			input	Next State			Flip Flop Input						Output
A	B	C	X	A <sup>+</sup>	B <sup>+</sup>	C <sup>+</sup>	JA	KA	JB	KB	JC	KC	Y
0	0	0	0	0	0	0	0	X	0	X	0	X	0
0	0	0	1	0	0	1	0	X	0	X	1	X	0
0	0	1	0	0	1	0	0	X	1	X	X	1	0
0	0	1	1	0	0	1	0	X	0	X	X	0	0
0	1	0	0	0	0	0	0	X	X	1	0	X	0
0	1	0	1	0	1	1	0	X	X	0	1	X	0
0	1	1	0	1	0	0	1	X	X	1	X	1	0
0	1	1	1	0	0	1	0	X	X	1	X	0	0
1	0	0	0	1	0	0	X	0	0	X	0	X	1
1	0	0	1	1	0	1	X	0	0	X	1	X	1
1	0	1	0	1	1	0	X	0	1	X	X	1	1
1	0	1	1	1	0	1	X	0	0	X	X	0	1
1	1	0	0	1	0	0	X	0	X	1	0	X	1
1	1	0	1	1	1	1	X	0	X	0	1	X	1
1	1	1	0	0	0	0	X	1	X	1	X	1	1
1	1	1	1	1	0	1	X	0	X	1	X	0	1



# Optimization

JA	C'				C	KA				JB	KB			
A'	0 <sup>0</sup>	0 <sup>1</sup>	0 <sup>3</sup>	0 <sup>2</sup>	B'	x <sup>0</sup>	x <sup>1</sup>	x <sup>3</sup>	x <sup>2</sup>	0 <sup>0</sup>	0 <sup>1</sup>	0 <sup>3</sup>	1 <sup>2</sup>	x <sup>2</sup>
A'	0 <sup>4</sup>	0 <sup>5</sup>	0 <sup>7</sup>	1 <sup>6</sup>	B	x <sup>4</sup>	x <sup>5</sup>	x <sup>7</sup>	x <sup>6</sup>	x <sup>4</sup>	x <sup>5</sup>	x <sup>7</sup>	x <sup>6</sup>	1 <sup>6</sup>
A	x <sup>12</sup>	x <sup>13</sup>	x <sup>15</sup>	x <sup>14</sup>	B	0 <sup>12</sup>	0 <sup>13</sup>	0 <sup>15</sup>	1 <sup>14</sup>	x <sup>12</sup>	x <sup>13</sup>	x <sup>15</sup>	x <sup>14</sup>	1 <sup>14</sup>
A	x <sup>8</sup>	x <sup>9</sup>	x <sup>11</sup>	x <sup>10</sup>	B'	0 <sup>8</sup>	0 <sup>9</sup>	0 <sup>11</sup>	0 <sup>10</sup>	0 <sup>8</sup>	0 <sup>9</sup>	0 <sup>11</sup>	1 <sup>10</sup>	x <sup>10</sup>

$JA = BCx'$        $KA = BCx'$        $JB = Cx'$        $KB = C + x'$

JC

KC

Y

0 <sup>0</sup>	1 <sup>1</sup>	x <sup>3</sup>	x <sup>2</sup>
0 <sup>4</sup>	1 <sup>5</sup>	x <sup>7</sup>	x <sup>6</sup>
0 <sup>12</sup>	1 <sup>13</sup>	x <sup>15</sup>	x <sup>14</sup>
0 <sup>8</sup>	1 <sup>9</sup>	x <sup>11</sup>	x <sup>10</sup>

x <sup>0</sup>	x <sup>1</sup>	0 <sup>3</sup>	1 <sup>2</sup>
x <sup>4</sup>	x <sup>5</sup>	0 <sup>7</sup>	1 <sup>6</sup>
x <sup>12</sup>	x <sup>13</sup>	0 <sup>15</sup>	1 <sup>14</sup>
x <sup>8</sup>	x <sup>9</sup>	0 <sup>11</sup>	1 <sup>10</sup>

0 <sup>0</sup>	0 <sup>1</sup>	0 <sup>3</sup>	0 <sup>2</sup>
0 <sup>4</sup>	0 <sup>5</sup>	0 <sup>7</sup>	0 <sup>6</sup>
1 <sup>12</sup>	1 <sup>13</sup>	1 <sup>15</sup>	1 <sup>14</sup>
1 <sup>8</sup>	1 <sup>9</sup>	1 <sup>11</sup>	1 <sup>10</sup>

JC = x

KC = x'

Y = A

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