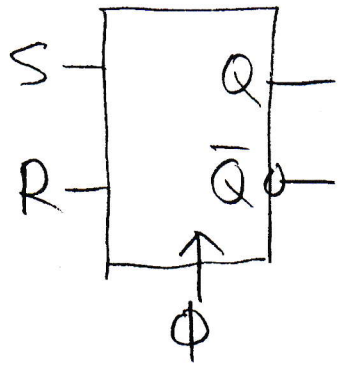
Ex) Sequential logic implementation using SRFF

Excitation table for SRFF.

Q(t)	Q(t+1)	S(t)	R(t)
0	0	0	X (reset or hold)
0	1	1	0
1	0	0	1
1	1	X	0 (set or hold)

X - don't care



Set Reset Flip-Flop (SRFF)

Implement following Mealy state machine using SRFF's.

Present Input X(t)	Present state A(t)	Next state A(t+1)	output f(t)	S(t)	R(t)
0	0	0	1	0	X
0	1	0	0	0	1
1	0	1	1	1	0
1	1	1	0	X	0

These two columns are added for SRFF implementation.

Three K-maps are needed for $f(t)$, $S(t)$ & $R(t)$.

$f(t)$ $A(t)$

$X(t)$ \ $A(t)$	0	1
0	1	0
1	1	0

$f(t) = \bar{A}(t)$

$S(t)$ $A(t)$

$X(t)$ \ $A(t)$	0	1
0	0	0
1	1	X

$S(t) = X(t)$

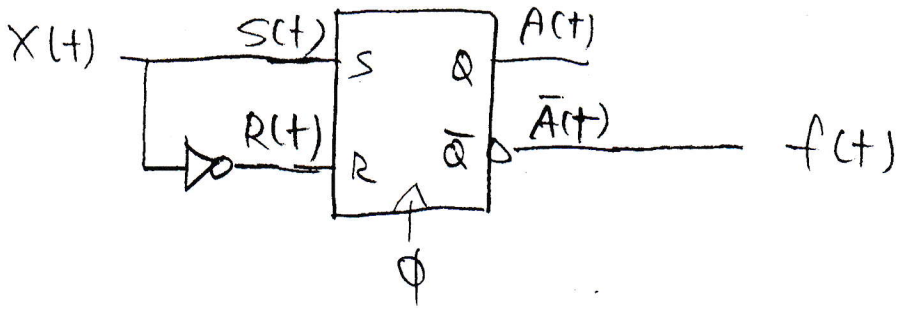
$R(t)$ $A(t)$

$X(t)$ \ $A(t)$	0	1
0	X	1
1	0	0

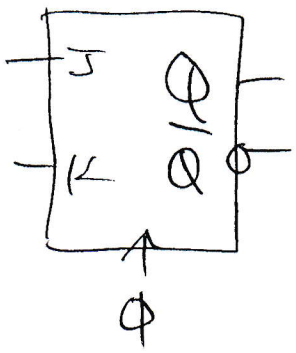
$R(t) = \bar{X}(t)$

Boolean exps in mSOP!

Logic diagram



ex) Implement same state machine w JKFF.



Excitation table

Q(t)	Q(t+1)	J(t)	K(t)	
0	0	0	X	(reset or hold)
0	1	1	X	(set or flip)
1	0	X	1	(reset or flip)
1	1	X	0	(set or hold)

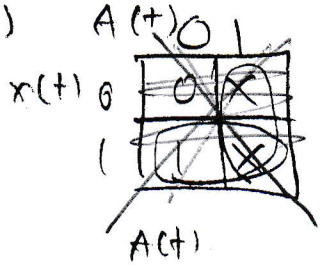
X(t)	A(t)	A(t+1)	f(t)
0	0	0	1
0	1	0	0
1	0	1	1
1	1	1	0

J(t)	K(t)	
0	X	
X	1	
1	X	
X	0	

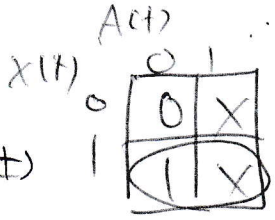
added for JKFF implementation

$f(t) = \bar{A}(t)$

J(t)

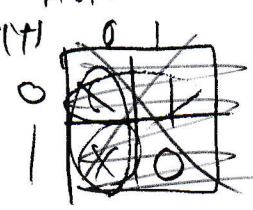


~~$J(t) = X(t) + A(t)$~~

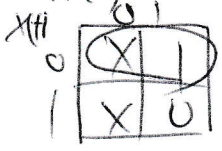


$J(t) = X(t)$

K(t)

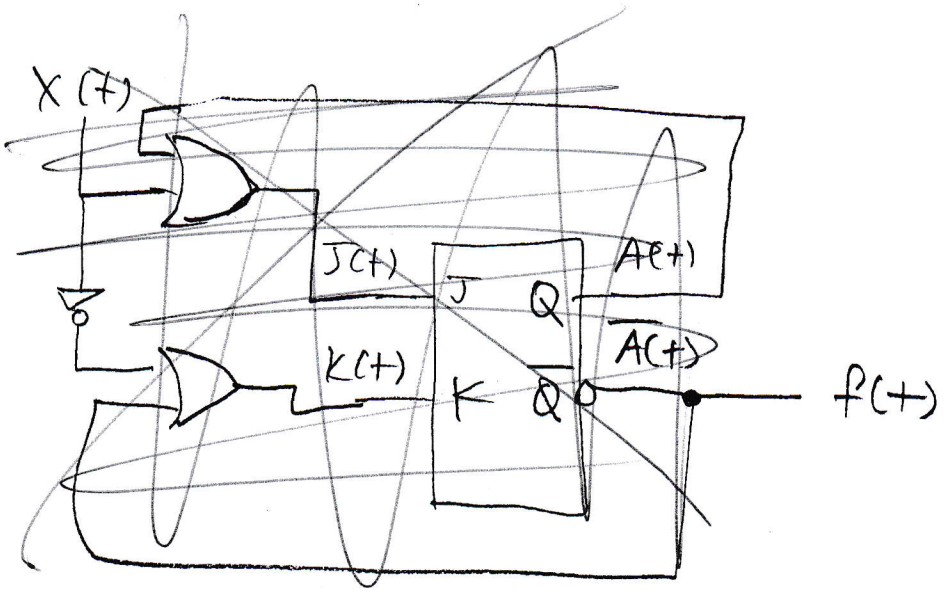


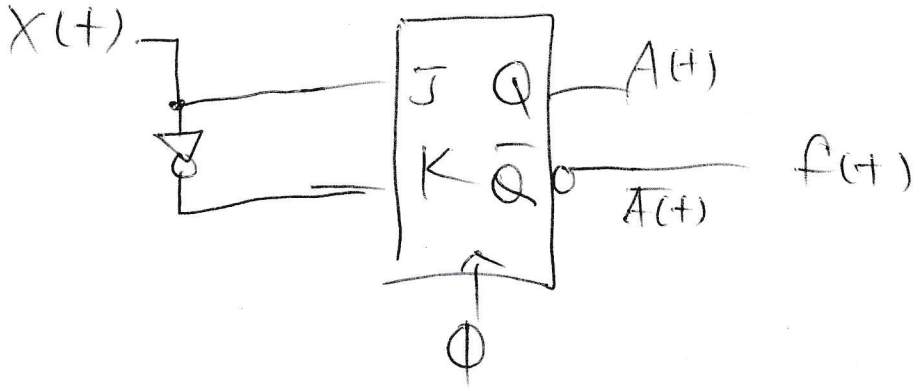
~~$K(t) = \bar{X}(t) + \bar{A}(t)$~~



$K(t) = \bar{X}(t)$

Logic diagram

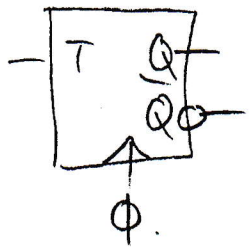




ex) T FF implementation of the same state machine.

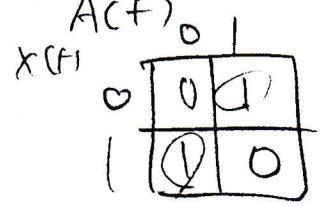
Q(t)	Q(t+1)	T(t)
0	0	0
0	1	1
1	0	1
1	1	0

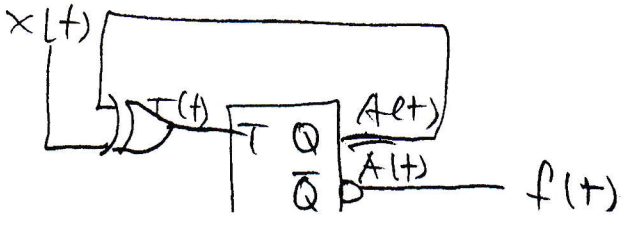
Excitation table.



X(t)	A(t)	A(t+1)	f(t)	T(t)
0	0	0	1	0
0	1	0	0	1
1	0	1	1	1
1	1	1	0	0

T(t)



$T(t) = \bar{X}(t) \cdot A(t) + X(t) \cdot \bar{A}(t)$ ← manual reduction

Logic diagram $= X(t) \oplus A(t)$