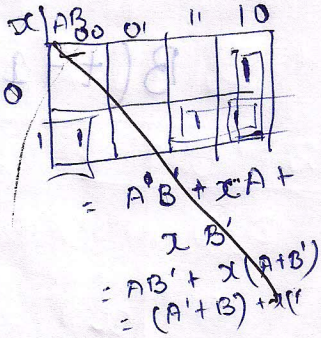
24.04.2015

State Equation

1) State equation is an algebraic equation that specifies the conditions for a flipflop state transition.

2) The left side of the equation denotes the next state of a flipflop and the right side of a Boolean function that specifies the present state conditions that make the next state equal to 1.

3) From the next state columns, we note that the flipflop A goes to the 1's state four times i.e;- when $x = 0$ and $AB = 01$ or 10, or 11 and when $x = 1$ and $AB = 11$.



$$A(t+1) = (A'B + AB' + AB)x' + ABx$$

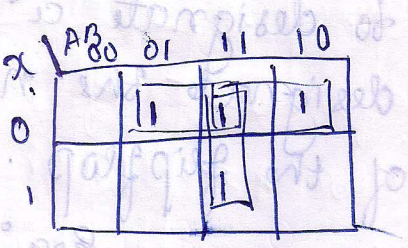
$$= x'A'B + x'AB' + x'AB + xAB$$

The right hand side of the state equation is a Boolean function for a present state.

When this function is equal to 1, the occurence of a clock pulse causes flipflop A, to have a next state of '1'.

When this function is equal to 0, the occurence of a clock pulse causes flipflop A, to have a next state of '0'.

On reducing the eqn —



$$x'(A+B) + AB$$

$$= Bx' + (B+x')A$$

$$= Bx' + (B'x)'A$$

$$= x'B + AB + x'A$$

If we let, $S = Bx'$ and $R = xB'$

Then eqn.

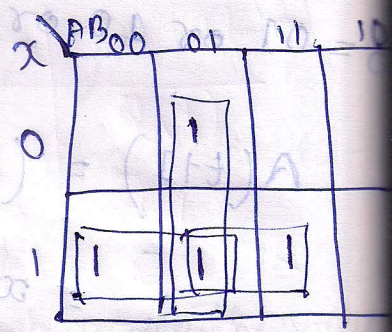
$$\boxed{A(t+1) = S + R'A}$$

Now,

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

$$= x'A'B + xA'B' + xA'B + xAB$$

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



$$= A'B + xA' + Bx$$

$$= A'x + B(x + A')$$

$$A'x + (x'A)'B$$

$$= A'B + x(A' + B$$

If we let $S = xA'$ and $R = x'A$

then

$$\boxed{B(t+1) = S + R'B}$$

Flipflop Input Function :-

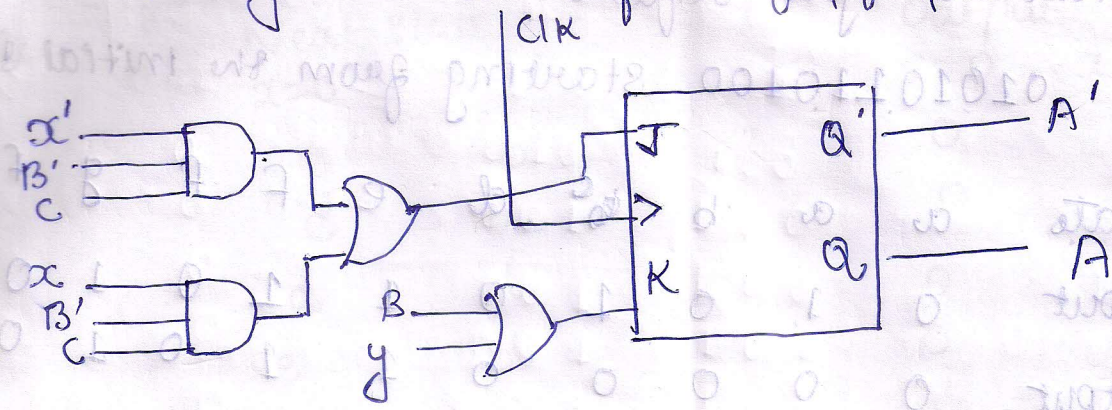
We shall adopt a convention of using two letters to designate a flipflop input variable. i.e :- the first designate the name of the input and the second the name of the flipflop.

Eg :- $JA = BC'x + B'Cx'$

$KA = B + y$

Here JA and KA denotes two Boolean variables. The first letter denote J and K input respectively of a JK flipflop.

Second letter is the symbol name of the flipflop:



For the example considered, input function can be written as —

$S_A = x'B$

$R_A = xB'$

$y = xAB'$

$S_B = xA'$

$R_B = x'A$

State Reduction and Assignment :-

State Reduction :-

The reduction of the number of flipflops in a sequential circuit is referred to as the state reduction problem.