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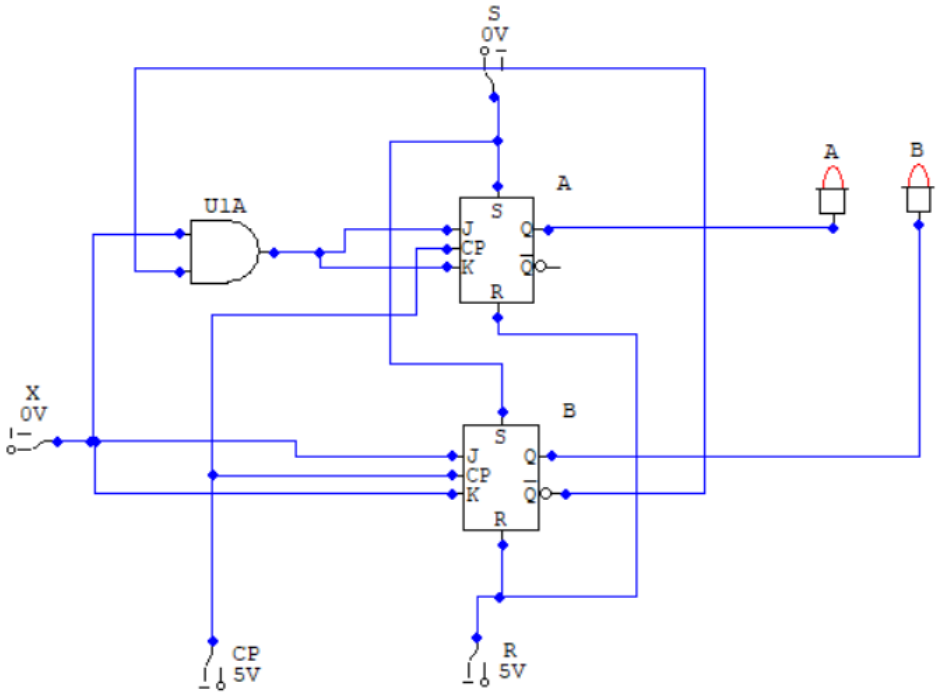
COMPUTER ARCHITECTURE
EXPERIMENT – 3

Implementation of Synchronous Sequential Circuits

Aim: In this experiment, students will be introduced to the concept of sequential circuits and implement a 2-bit Counter.

Experimental Work:

Given the following sequential circuit:



x

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CP

1. Draw the logic diagram of the given sequential circuit in Circuit Maker 6.0.

a) Implement your inputs as logic switches.
Devices → Hotkeys2 → logic switch

b) Implement your circuit using logic gates and JK- Flip Flops (4027).
(You can search devices from *devices → search*)

c) Implement your outputs as logic displays.
Devices → Hotkeys1 → logic display

2. Run your circuit and complete the following state table:

Present State			**Next State**			
A(t)	**B(t)**	**x**	**A(t+1)**	**B(t+1)**		
0	**0**	**0**	**0 A(t)**	**0 B(t)**	**A(t)**	**B(t)**
0	**0**	**1**	**1**	**1**	**A(t+1)**	**B(t+1)**
0	**1**	**0**	**0 A(t)**	**1 B(t)**	**A(t)**	**B(t)**
0	**1**	**1**	**0**	**0**	**A(t+1)**	**B(t+1)**
1	**0**	**0**	**1 A(t)**	**0 B(t)**	**A(t)**	**B(t)**
1	**0**	**1**	**0**	**1**	**A(t+1)**	**B(t+1)**
1	**1**	**0**	**1 A(t)**	**1 B(t)**	**A(t)**	**B(t)**
1	**1**	**1**	**1**	**0**	**A(t+1)**	**B(t+1)**

3. Supply your flip-flop input equations:

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Present State			Next State			
A(t)	B(t)	x	A(t+1)	B(t+1)		
0	0	0	0	0	A(t)	B(t)
0	0	1	1	1	A(t+1)	B(t+1)
0	1	0	0	1	A(t)	B(t)
0	1	1	0	0	A(t+1)	B(t+1)
1	0	0	1	0	A(t)	B(t)
1	0	1	0	1	A(t+1)	B(t+1)
1	1	0	1	1	A(t)	B(t)
1	1	1	1	0	A(t+1)	B(t+1)

3. Supply your flip-flop input equations:

$T_A = A \cdot B'$ $T_B = A$

$Q(t+1) = T \cdot Q' + T' \cdot Q$

$A(t+1) = T_A \cdot A' + T_A' \cdot A$

$A(t+1) = A \cdot B' \cdot A' + (A \cdot B')' \cdot A$

$A(t+1) = 0 + (A' + B) \cdot A$

$A(t+1) = A' \cdot A + A \cdot B$

$A(t+1) = 0 + A \cdot B$

$A(t+1) = A \cdot B$

$B(t+1) = T_B \cdot B' + T_B' \cdot B$

$B(t+1) = A \cdot B' + A' \cdot B$

$B(t+1) = A \oplus B$