North South University
Department of Electrical & Computer Engineering

LAB REPORT

Course Code : EEE211

Course Title: Digital Electronics

Section: 01

Experiment Number: 08

Experiment Name: Introduction to Flip flop and Sequential Circuit

Experiment Date: 04.01.2021

Date of Submission: 10.01.2021

Course Instructor: Fahimul Haque

Submitted To: Fatema Zahra

Experiment Name:

Introduction to flip-flops & Sequential circuits.

Objective:

→ Learning the concept of states in digital logic & how flip-flop circuits can be used to store state information.

→ Understand the internal logic & relationship among J-K, T & D flip-flops & observe their characteristics.

→ Understand & design synchronous sequential circuit as per state diagram.

Theory:

Flip-flop is a storage device which has two stable states & has capability of storing one bit of binary information. The output of the flip-flop can only change if a clock pulse is supplied to flip-flop. There are three types of flip-flops. They are J-K, D & T flip flop. Each of them has different characteristics.

Sequential logic is a type of logic circuit whose output depends both on the present value of its input & sequence of past input. It is a contrast to combinational logic.

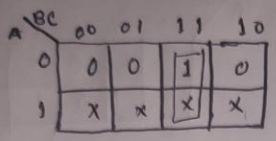
Apparatus:

- IC 7474 (Dual D Flip-Flops)
- IC 74107 (Dual JK Flip Flops)
- T Flip Flop.
- Trainer Board.

Table:

Previous State			Next State			JK			T			D.		
A	B	C	A_n	B_n	C_n	A	B	C	A	B	C	A	B	C
						J_AK_A	J_BK_B	J_CK_C	T_A	T_B	T_C	D_A	D_B	D_C
0	0	0	0	0	1	0 X	0 X	1 X	0	0	1	0	0	1
0	0	1	0	1	0	0 X	1 X	X 1	0	1	1	0	1	0
0	1	0	0	1	1	0 X	X 0	1 X	0	0	1	0	1	1
0	1	1	1	0	0	1 X	X 1	X 1	1	1	1	1	0	0
1	0	0	1	0	1	X 0	0 X	1 X	0	0	1	1	0	1
1	0	1	1	1	0	X 0	1 X	X 1	0	1	1	1	1	0
1	1	0	1	1	1	X 0	X 0	1 X	0	0	1	1	1	1
1	1	1	0	0	0	X 1	X 1	X 1	1	1	1	0	0	0

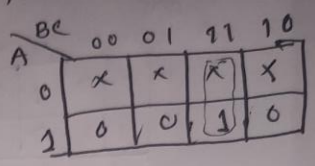
For J_A.



A \ BC	00	01	11	10
0	0	0	1	0
1	x	x	x	x

$\therefore J_A = BC$

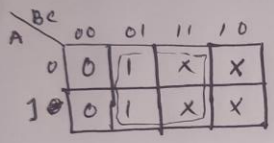
For K_A



A \ BC	00	01	11	10
0	x	x	x	x
1	0	0	1	0

$\therefore K_A = BC$

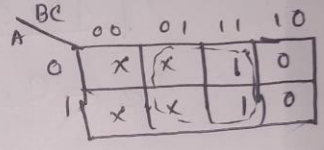
For J_B



A \ BC	00	01	11	10
0	0	1	x	x
1	0	1	x	x

$\therefore J_B = C$

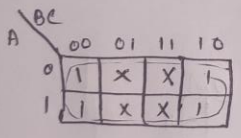
For K_B



A \ BC	00	01	11	10
0	x	x	1	0
1	x	x	1	0

$\therefore K_B = C$

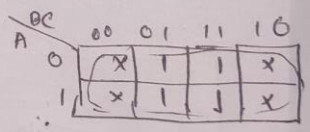
For J_C



A \ BC	00	01	11	10
0	1	x	x	1
1	1	x	x	1

$\therefore J_C = 1$

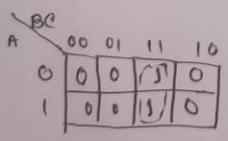
For K_C



A \ BC	00	01	11	10
0	x	1	1	x
1	x	1	1	x

$\therefore K_C = 1$.

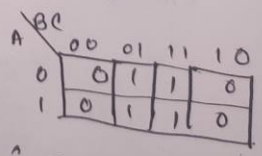
For T_A.



A \ BC	00	01	11	10
0	0	0	1	0
1	0	0	1	0

$\therefore T_A = BC$

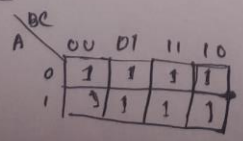
For T_B



A \ BC	00	01	11	10
0	0	1	1	0
1	0	1	1	0

$\therefore T_B = C$.

For T_C



A \ BC	00	01	11	10
0	1	1	1	1
1	1	1	1	1

$\therefore T_C = 1$.

For D_A.

A \ BC	00	01	11	10
0	0	0	1	0
1	1	1	0	1

$\therefore D_A = AC' + AB' + A'BC$

For D_B.

A \ BC	00	01	11	10
0	0	1	0	1
1	0	1	0	1

$\therefore D_B = BC' + B'C$

For D_C

A \ BC	00	01	11	10
0	1	0	0	1
1	1	0	0	1

$\therefore D_C = C.$

Circuit Diagram:

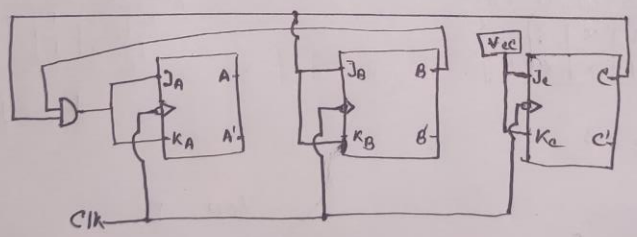


Figure : JK Flip-Flop.

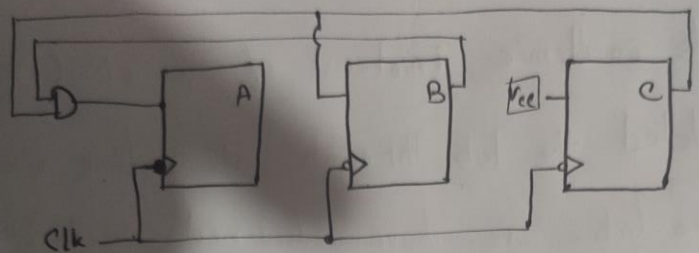


Figure: T. Flip-Flop.

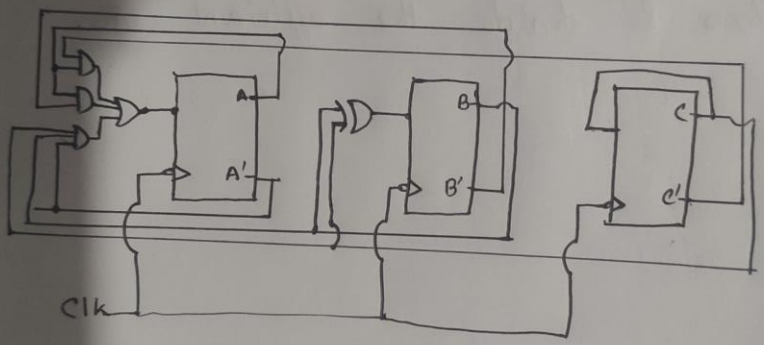
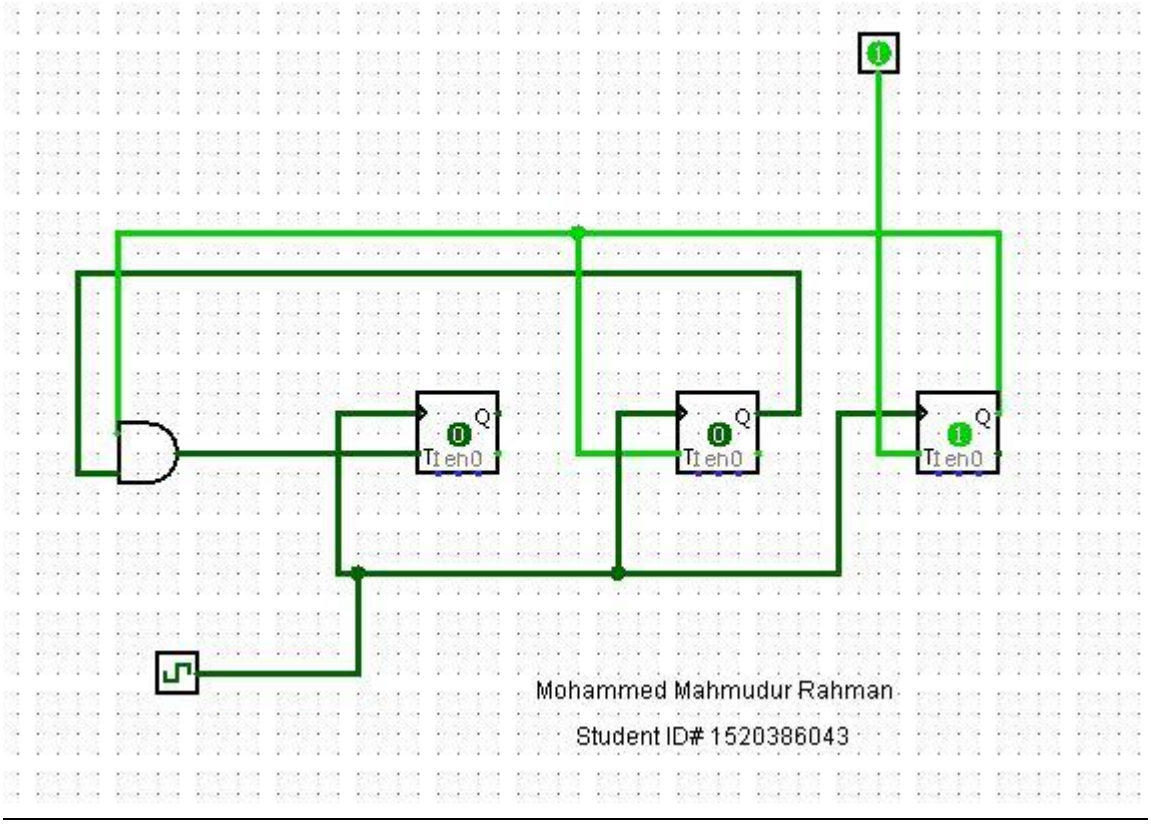


Figure: D flip flop

Discussion:

Due to pandemic instead of practical session we completed the lab through online simulation. Through this lab, we have learned to implement flip-flop & design the sequential circuit. We also learned compare between different flip-flops & decide the efficient one.

Simulation: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Mohammed Mahmudur Rahman
Student ID# 1520386043