



K. J. Somaiya College of Engineering, Mumbai-77

Experiment / Assignment / Tutorial No. 5

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

Batch: D2

Roll No.: 16010122323

Experiment / assignment / tutorial No.: 5

Title: Flip Flops

Objective: Design of JK Flip flop, D flip flop, T flip flop using NAND Gates & verification of the same flip flop using IC7476

Expected Outcome of Experiment:

CO2: Use different minimization technique and solve combinational circuits, synchronous & asynchronous sequential circuits.

Books/ Journals/ Websites referred:

- VLab Link: <http://vlabs.iitkgp.ernet.in/dec/#>
- R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill
- M. Morris Mano, "Digital Logic & computer Design", PHI
- A.P. Godse, D.A. Godse, "Digital Logic Design"

Pre Lab/ Prior Concepts:

K. J. Somaiya College of Engineering, Mumbai-77

Flip-flop is the common name given to two-state devices which offer basic memory for sequential logic operations. Flip-flops are heavily used for digital data storage and transfer and are commonly used in banks called "registers" for the storage of binary numerical data.

JK-flip flop: has two inputs, traditionally labeled J and K. IC 7476 is a dual JK master slave flip flop with preset and clear inputs. If J and K are different then the output Q takes the value of J at the next clock edge. If J and K are both low then no change occurs. If J and K are both high at the clock edge, then the output will toggle from one state to the other. It can perform the functions of the set/reset flip-flop and has the advantage that there are no ambiguous states.

D Flip Flop: tracks the input, making transitions with match those of the input D. The D stands for "data"; this flip-flop stores the value that is on the data line. It can be thought of as a basic memory cell. D flip-flop can be made from J-K flip-flop by connecting both inputs through a not gate.

T Flip Flop: T or "toggle" flip-flop changes its output on each clock edge, giving an output which is half the frequency of the signal to the T input. It is useful for constructing binary counters, frequency dividers, and general binary addition devices. It can be made from a J-K flip-flop by tying both of its inputs high.

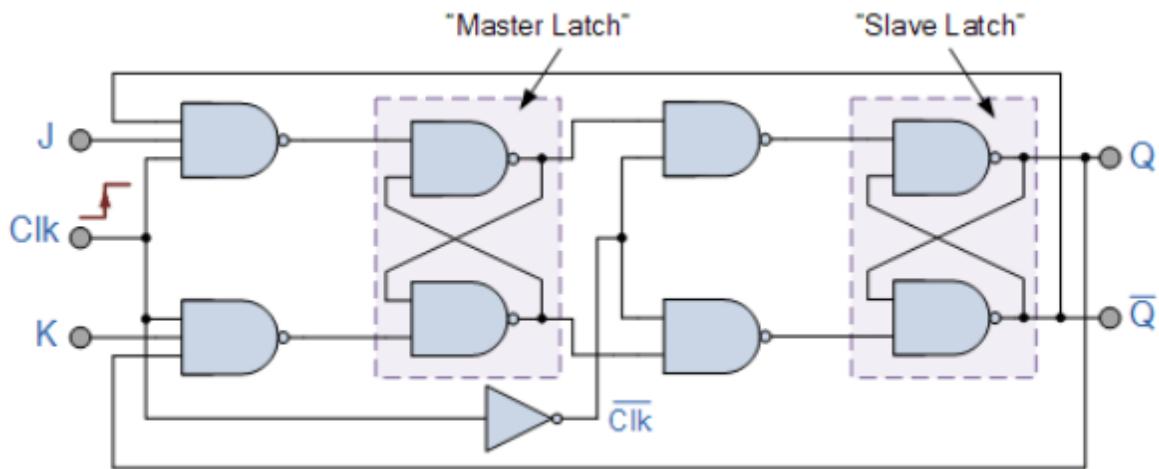
Implementation Details:

Procedure

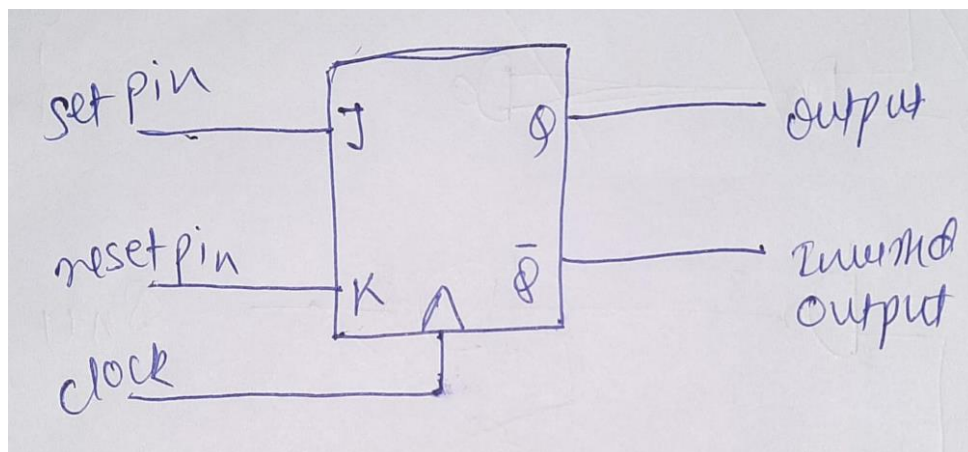
- 1) Locate IC 7476 on Digital trainer kit
- 2) Apply various inputs to J & K pins by means of the output on logic output indicator.
- 3) Connect a pulsar switch to the clock input.
- 4) Connect the J&K as D and T flip flop as shown in diagrams and verify the respective truth tables.

K. J. Somaiya College of Engineering, Mumbai-77

Pin Diagram of IC 7476 JK Master- Slave FF



Logic Symbol



K. J. Somaiya College of Engineering, Mumbai-77

Truth Table

J	K	Q	Q'
0	0	1	0
0	0	0	1
0	1	1	0
0	1	0	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

D FF

Truth Table

D	O/P
0	1
1	1

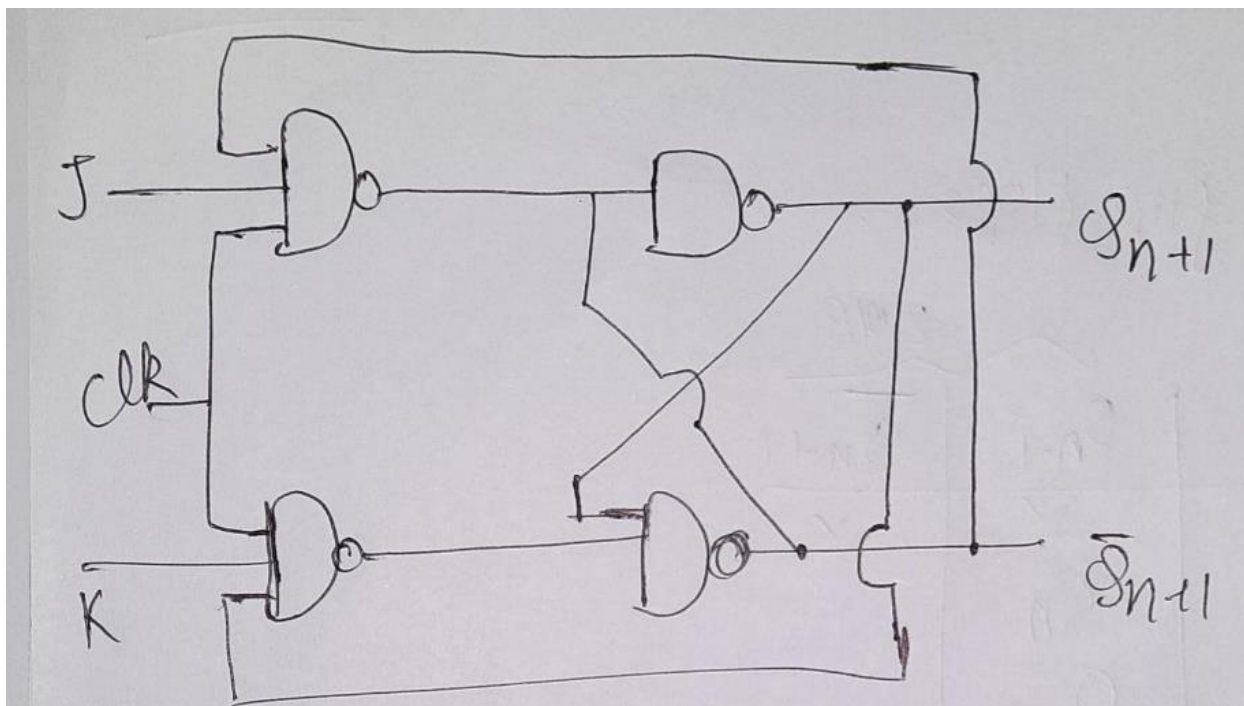
TFF

Truth Table

K. J. Somaiya College of Engineering, Mumbai-77

T	O/P
0	Q_n
1	Q_n'

Diagram of JK Flip Flop using NAND gates



K. J. Somaiya College of Engineering, Mumbai-77

Conclusion: In this experiment, we learned to design of JK Flip flop, D flip flop, T flip flop using NAND Gates & verification of the same flip flop using IC7476

Post Lab Descriptive Questions

1. How does a JK flip-flop differ from an SR flip-flop in its basic operation?

Ans) **While both JK and SR flip-flops are used for sequential logic operations, the JK flip-flop is more versatile and does not have the same forbidden state issues as the SR flip-flop. However, the SR flip-flop is simpler in terms of its behavior and logic, making it easier to understand and implement in some cases. The choice between the two depends on the specific requirements of a digital circuit.**

2. What is the use of characteristic and excitation table?

Ans) **Characteristic Table:**

The characteristic table provides a clear and organized representation of the behavior of a digital component, such as a flip-flop or a sequential circuit, by showing all possible input combinations and their corresponding output states.

Excitation Table:

The excitation table is primarily used in the analysis and design of sequential circuits, especially flip-flops. It describes the necessary input conditions (excitation states) to achieve a desired state transition in the flip-flop.

3. How many flip flops do you require storing the data 1101?

Ans) **4**

4. Convert JK flip flop to D and T flip flops.

Ans)

K. J. Somaiya College of Engineering, Mumbai-77

