

**North South University**  
**Department of Electrical and Computer Engineering**  
**CSE 231L: Digital Logic Design Lab**  
**Lab 08: Introduction to Flip-flop and Registers**

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**A. Introduction:**

A flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bistable multivibrator. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic. Flip-flops and latches are a fundamental building block of digital electronics systems used in computers, communications, and many other types of systems.

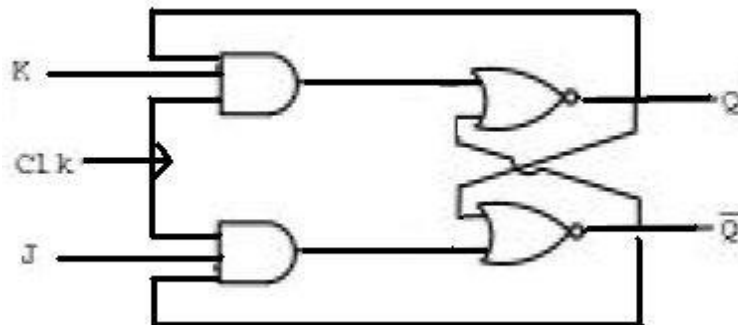
We'll design JK flip-flop, T flip-flop and D flip-flop in this experiment.

**Job -1:**

Design of a J-K Flip-flop using AND and NOR gates only.

**Procedure:**

1. The logic diagram to implement J-K Flip-flop.
2. Fill up the Table with different combination of inputs.



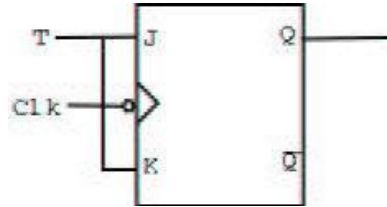
J	K	Q	Q'
1	0		
0	0		
0	1		
0	0		
1	1		
1	0		
1	1		

### Job -2:

Design of a T Flip-flop using a J-K Flip-flop.

#### Procedure:

1. Draw the logic diagram to implement T Flip-flop.
2. Fill up the Table with different combination of inputs.



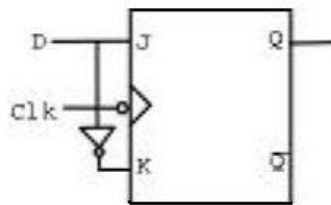
T	Q
0	
1	

### Job -3:

Design of a D Flip-flop using a J-K Flip-flop.

#### Procedure:

- 1) Draw the logic diagram to implement D Flip-flop.
- 2) Fill up the Table with different combination of inputs.



D	Q
0	
1	

### B. Register:

A register is a group of flip-flops. Each flip-flop is capable of storing one bit of information. An n-bit register contains a group of n flip-flops capable of storing n bits of binary information. In addition to flip-flops, a register may have combinational gates that perform certain data processing tasks. In broadest definition, a register consists of a group of flip-flops and gates that effect their transition. The flip-flop holds binary information and the gates determine how the information is transferred into the registers.

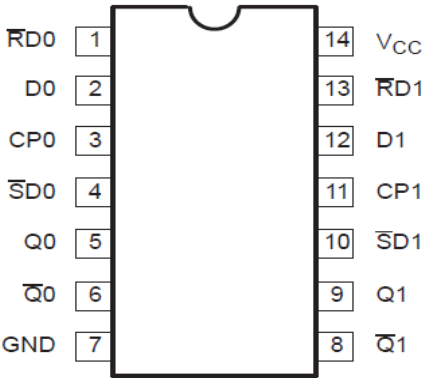
A register is capable of shifting its binary information either to its right or its left is called a shift register. The logical configuration of a shift register consists of a chain of flip-flops connected in cascade, with the output of one flip flop connected to the input of the next flip-flop. All flip-flops receive a common pulse which causes the shift from one stage to the next.

In this experiment, you will use D flip-flop to construct a right shift register.

Equipments:

- Trainer Board
- IC 7474 (D flip-flop)
- Wires for connection.

Layout diagram of IC 7474:



PINS	DESCRIPTION
D0, D1	Data inputs
CP0, CP1	Clock inputs (active rising edge)
SD0, SD1	Set inputs (active low)
RD0, RD1	Reset inputs (active low)
Q0, Q1, Q0, Q1	Data outputs

Circuit Diagram:

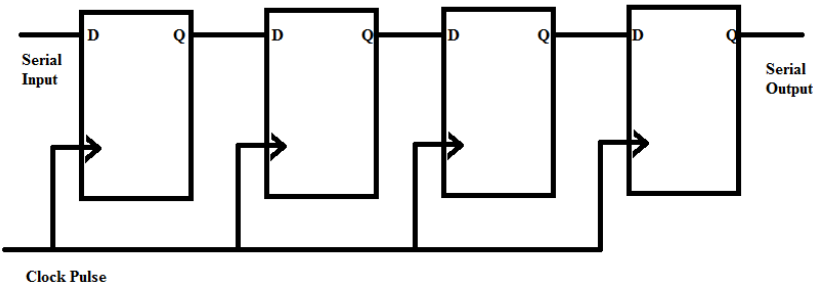


Figure: Shift Register

State Table:

States	Input	Output
Initial State	X	XXXX
T1	1	1XXX
T2	0	01XX
T3	1	101X
T4	0	0101

**Procedure:**

1. Collect the required equipments.
2. Construct the circuits according to the given diagrams and pin configuration of the IC7474.
3. Observe the outputs.

**C. Report:**

Design a 2 bit up counter using D Flip Flop.