University of Engineering & Management, Kolkata

Subject Name: Computer Organization & Architecture Laboratory

Subject Code: PCCCS492

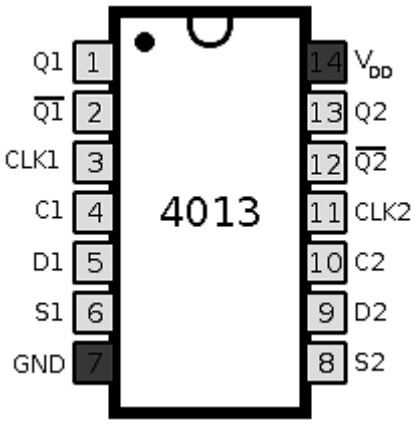
ASSIGNMENT – 4

4.1. TITLE: Design of Shift Register using D Flip Flop.

4.2. APPARATUS REQUIRED:

a. Logic trainer kit
b. Breadboard
c. Single strand wires
d. Integrated circuit's (IC-4013 (D Flip Flops))

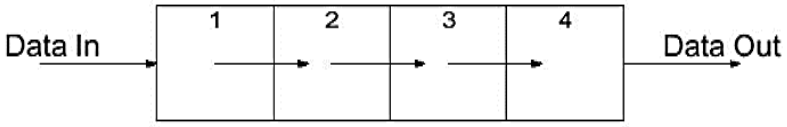
4.2.1. Pin diagram of IC-4013 is represented below:



4.3. THEORY: A shift register is a type of digital circuit using a cascade of flip-flops where the output of one flip-flop is connected to the input of the next. They share a single clock signal, which causes the data stored in the system to shift from one location to the next. Shift registers can have both parallel and serial inputs and outputs. These are often configured as "Serial-in serial-out (SISO)", "Serial-in parallel-out (SIPO)" and "Parallel-in serial-out (PISO)". There are also types that have both serial and parallel input and types with serial and parallel output. There are also "bidirectional" shift registers, which allow shifting in both directions: L → R or

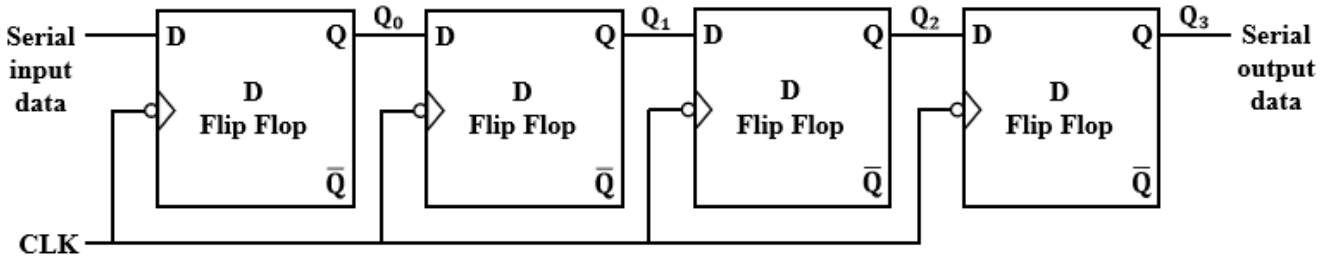
R → L. A PIPO register (parallel-in parallel-out) is very fast – an output is given within a single clock pulse.

4.3.1. SERIAL-IN/SHIFT-RIGHT/SERIAL-OUT OPERATION: Data is shifted in the right hand direction one bit at a time with each transition of the clock signal. The data enters the shift register serially from the left hand side and after four clock transitions the 4-bit registers has 4-bits of data. The data is shifted out serially one bit at a time from the right hand side of the register if clock signals are continuously applied. Thus after 8 clock signals the 4-bit data is completely shifted out of the shift register.

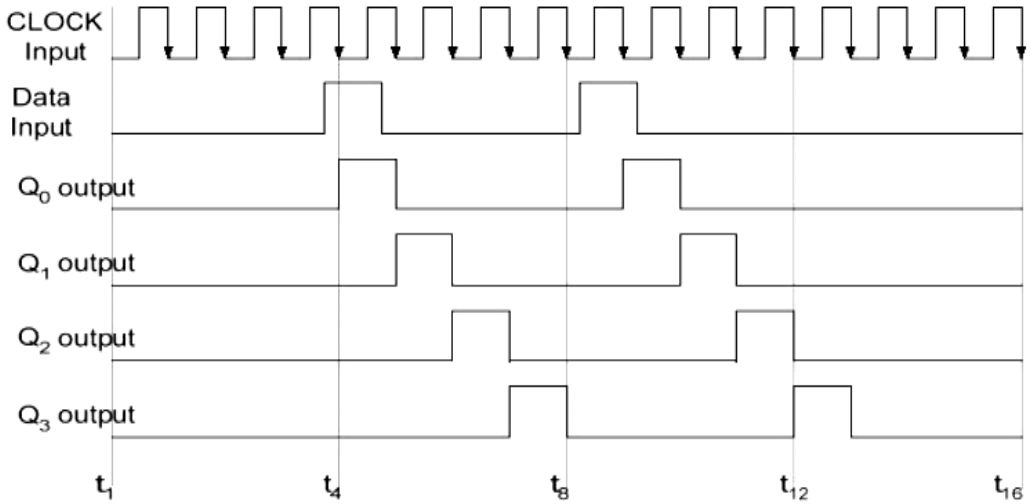


Serial shift registers can be implemented using D Flip Flops.

4.3.2. SERIAL-IN/SHIFT-RIGHT/SERIAL-OUT REGISTER USING D FLIP FLOP:



4.3.3. TIMING DIAGRAM OF A SERIAL-IN/SHIFT-RIGHT/SERIAL-OUT REGISTER:



4.3.4. SERIAL-IN/SHIFT-RIGHT/SERIAL-OUT REGISTER TRUTH TABLE:

Outputs	**Q_0**	**Q_1**	**Q_2**	**Q_3**

Reset	0	0	0	0
CLK pulse 1	1	0	0	0
CLK pulse 2	0	1	0	0
CLK pulse 3	0	0	1	0
CLK pulse 4	0	0	0	1

4.3.5. ADVANTAGES OF SHIFT REGISTER:

a. Storing and shifting large amounts of data in a small space
b. Low power consumption
c. High-speed operation
d. Flexibility in data manipulation and conversion
e. Use in a wide range of applications
f. Very fast to use
g. Very quick when you want to convert data from serial to parallel or vice versa
h. Very simple in design

4.3.6. DISADVANTAGES OF SHIFT REGISTER:

a. Speed of data loading and data reading operations is limited due to propagation delay in shift register

4.3.7. APPLICATIONS OF SHIFT REGISTER:

a. Temporary data storage
b. Serial adder and subtractor
c. Multiplication and division operation
d. Delay line
e. Serial to parallel converter
f. Parallel to serial converter
g. Ring counter
h. Twisted ring counter or Johnson counter

4.4. PROCEDURE:

I. Connections are given as per circuit diagram.
II. Logical inputs are given as per circuit diagram.
III. Observe the output and verify the truth table.

4.5. RESULT:

Thus the Shift registers were designed and their truth table is verified.

4.6. PRECATIONS:

• All connections should be made neat and tight.
• Digital lab kits and ICs should be handled with utmost care.
• While making connections main voltage should be kept switched off.
• Never touch live and naked wires.

4.7. CONCLUSION: