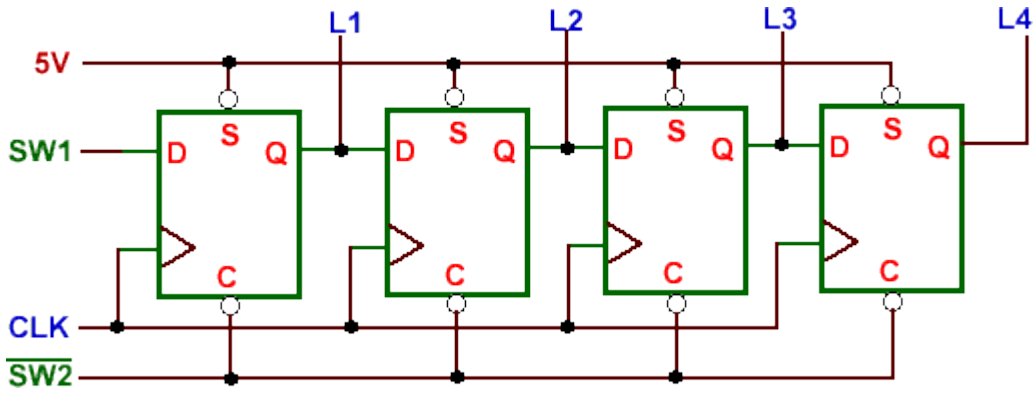
Experiment No 2.

SERIAL IN SERIAL OUT

1. Theory:-

A shift register is an n-bit register with provision for shifting its stored data by one position at each clock pulse. 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 clock pulse which causes the shift from one stage to the next. Fig.1 shows below is a simple shift register configuration. Most shift registers have provision for shifting only in one direction, but some have a control input that allows either left or right shifting to be specified at each clock.



[Fig:1 Serial in Serial out]

One way to load *n* bits of data into the flip-flop chain is to load the data one bit each clock cycle using the serial input. Some shift registers also have parallel inputs that can be used to load all *n* bits in one clock cycle. The output of a shift register can be observed one bit at a time at the serial output, but some shift registers also have parallel outputs for observing all *n* bits at once.

Shift registers are classified according to three basic considerations: their method of data handling (serial-in serial-out, serial-in parallel-out, and parallel-in serial-out), their direction of data movement (shift right, shift left, and bidirectional), and their bit length. One of the

important applications of shift register circuits is in serial computation. Compared to parallel computation, where all bits in a word are processed at the same cycle, serial computation process words in one bit per cycle. Therefore, serial computation is slower, but it has the advantage of requiring less hardware and wiring.

2. Schematic Diagram:-

The schematic diagram of Serial in Serial out in eSim is as follows,

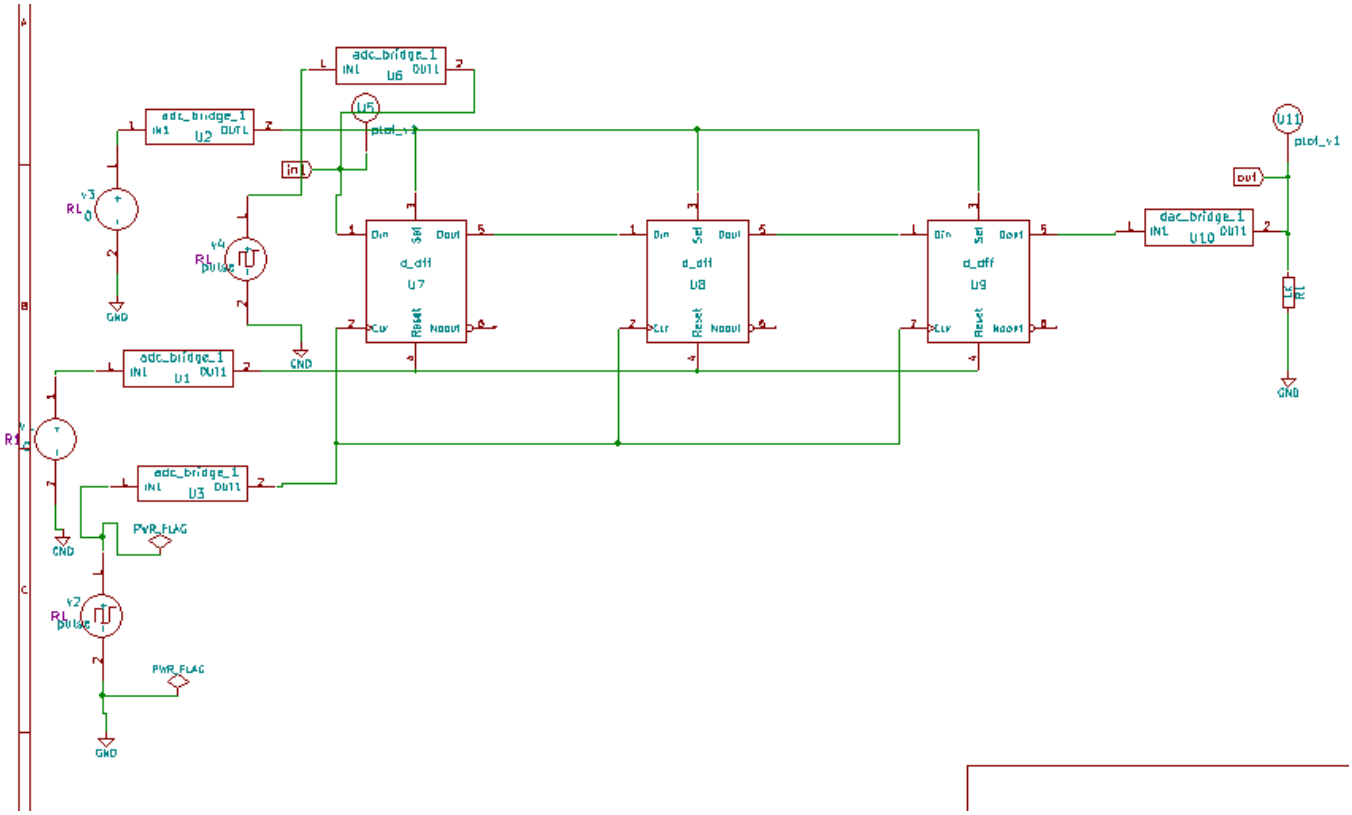


Figure 1. Schematic Diagram of **Serial in Serial out**

3. Simulation Results:

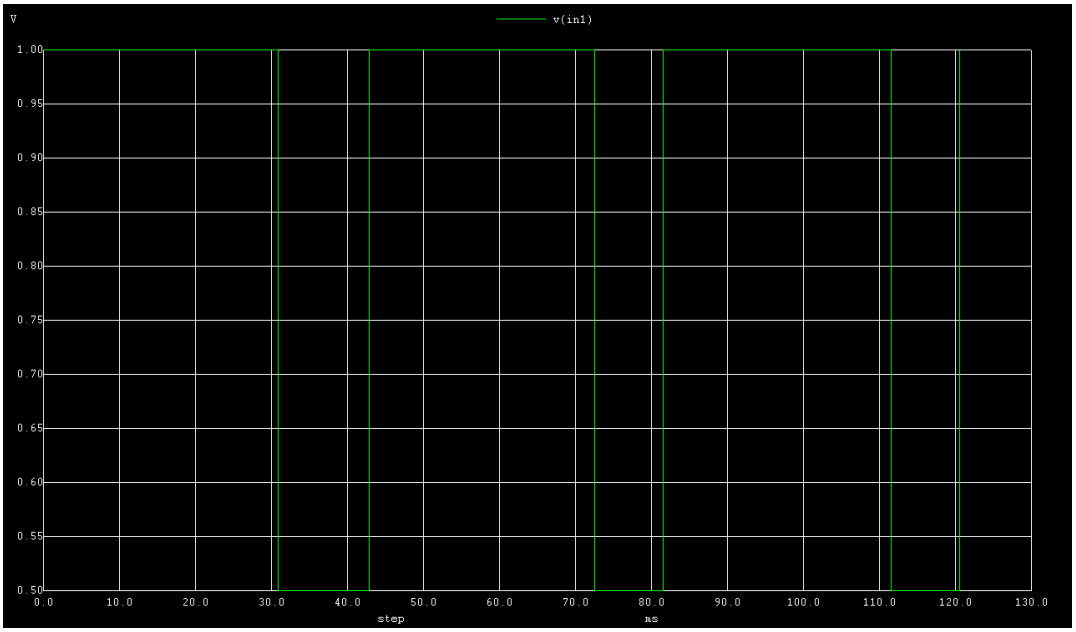


Figure 1: Ngspice Input Plot

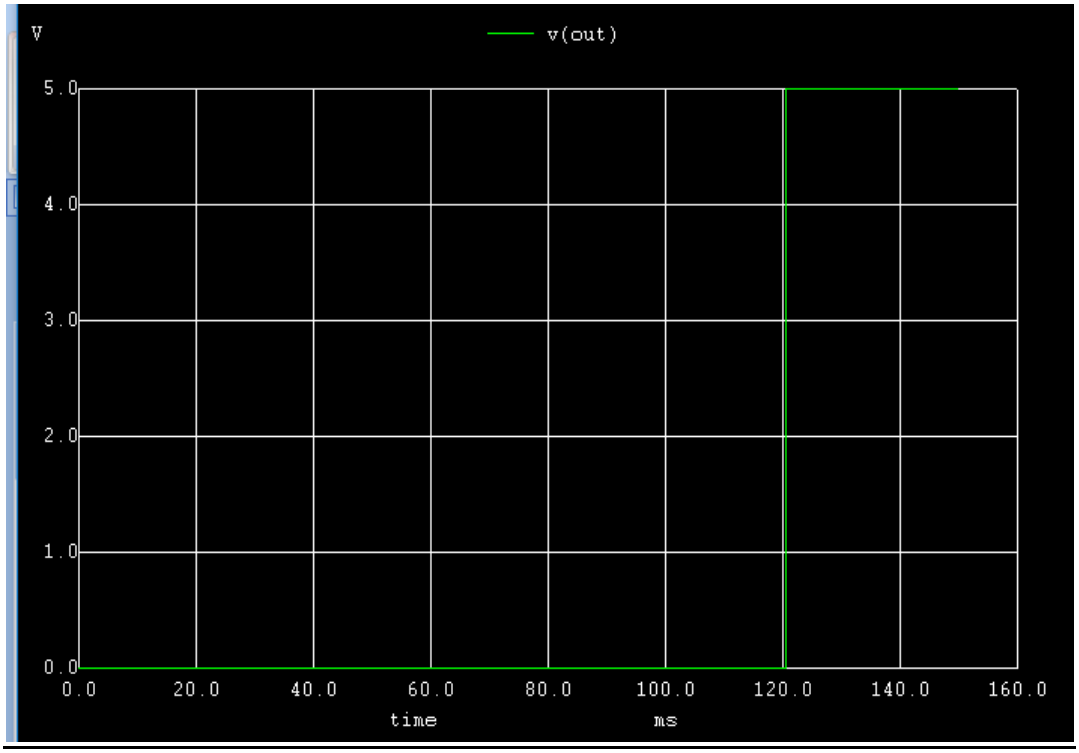


Figure 2: Ngspice Output Plot

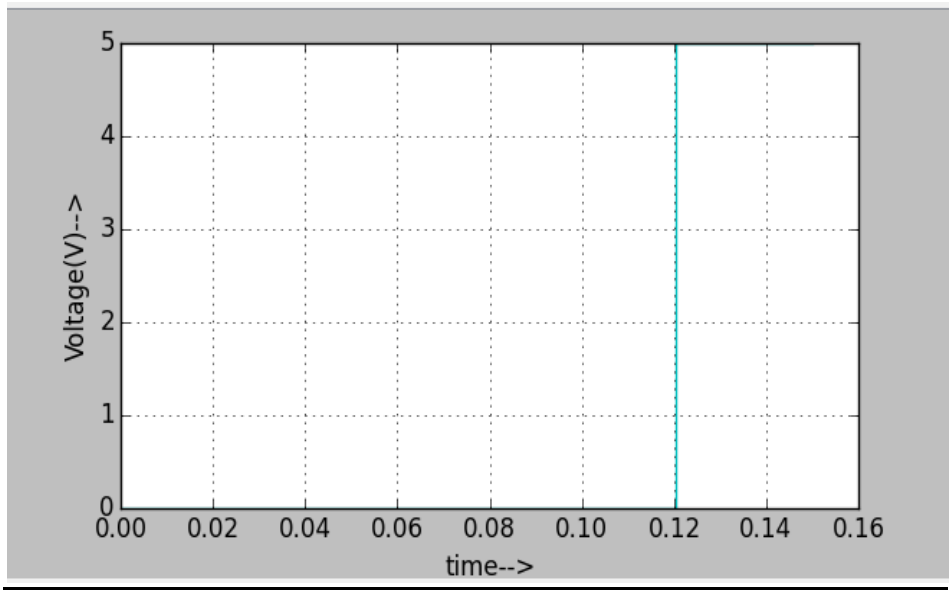


Figure 3: Python Output plot

4. **Conclusion :-** Thus we have simulated serial in serial out circuit using eSim and output wave form is observed.

5. **Reference:-**

https://www.electronics-tutorials.ws/sequential/seq_5.html.

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