Shift Registers Circuits

Objective: Using D flipflops construct various types of shift registers and study Psuedo random number generation using Shift Registers.

Background: Shift registers are vital in applications involving storage and transfer of data in a digital system. Shift Register is made with connecting D(Data) Flip Flops. Data is binary number either 1 or 0. Four different types of Shift Registers are possible as shown in the figure.

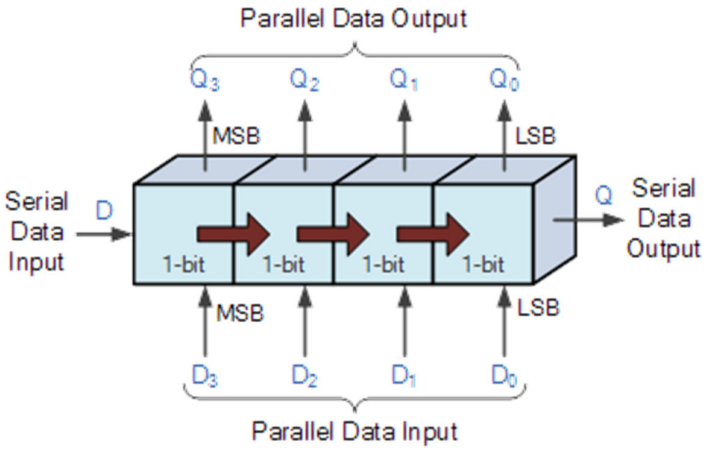
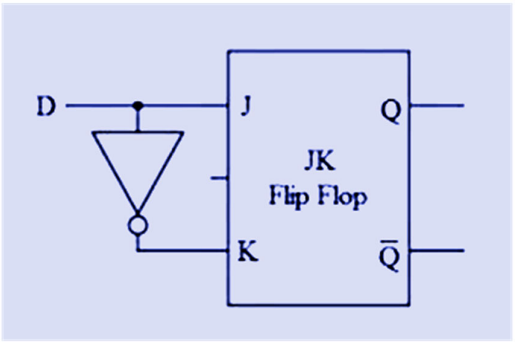


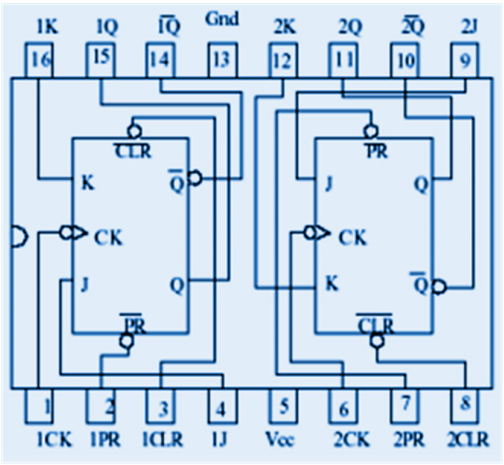
Fig. Four types of Shift Registers

In this experiment, D Flip flops are achieved using JK Flip Flop. Connect PR and CLR to logic 1 during the experiment.

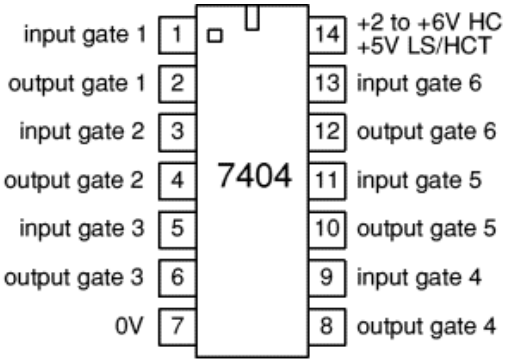
Circuit to make D flipflop using JK flipflop:



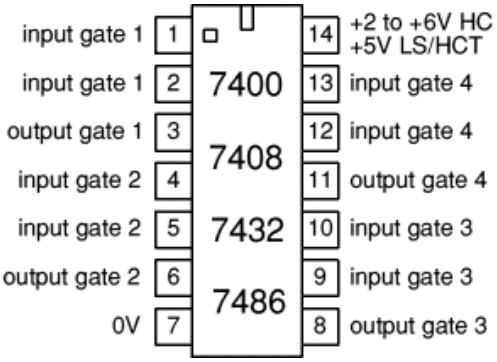
7476 IC pin diagram (JK Flipflop).



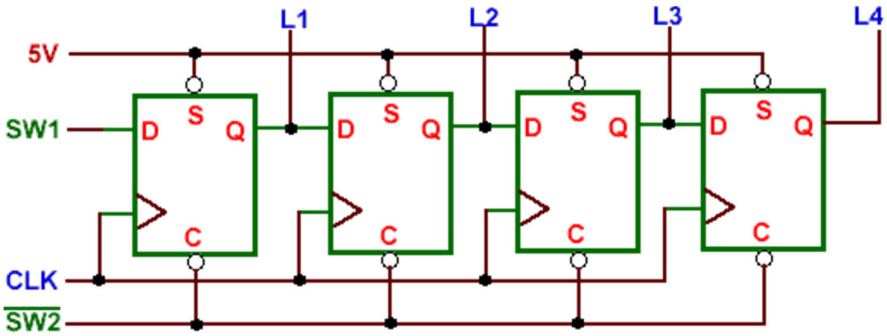
Inverter gate (NOT): IC 7404LS



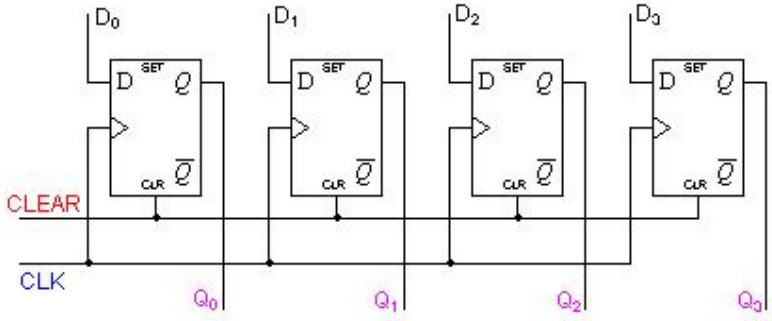
2-input AND/OR/EX-OR gate: IC 7408LS/7432/7486



Seriel in serial out shift register: Construct the serial in-serial out and serial in and parallel out circuit and then demonstrate how 4 digit binary is shifted and stored in it.

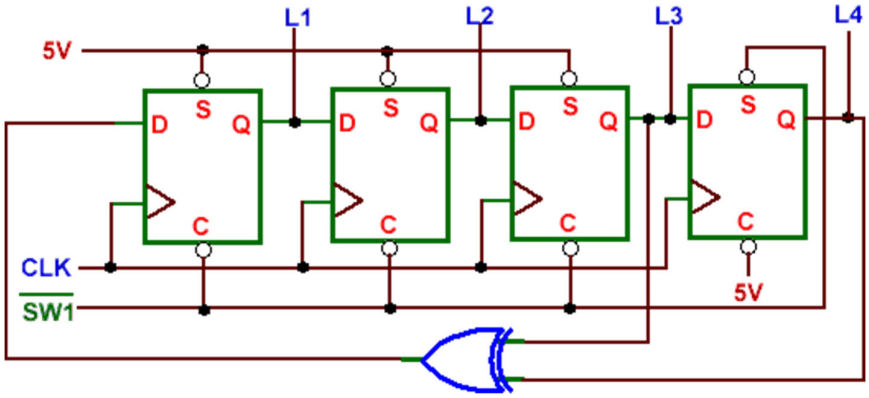


Parallel in parallel out shift register circuit diagram. SET and CLEAR are kept at logic 1 or connected to 5 V.



Observations: ….

Pseudo Random number generation (optional experiment): Different sequences of Random numbers can be generated with Shift registers and using XOR gate. Below diagram is for a good choice of XOR to generate Random number. Verify it and what are the other types Random number sequences are possible?



At each time step:

1. Bits 3 and 2 are combined by exclusive-or.
2. The register is shifted 1 step to the left.
3. The result of the exclusive-or is entered into bit 0.

Here is the pattern of bits, starting with `0001`:

```
 0001
0010
0100
1001
0011
0110
1101
1010
0101
1011
0111
1111
1110
1100
1000
0001
```

Further information on Random number generation:
http://www.cs.miami.edu/home/burt/learning/Csc609.022/random_numbers.html