# Chapter-3

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Registors

- A Register is **a device which is used to store such information**. It is a group of flip flops connected in series used to store multiple bits of data. The information stored within these registers can be transferred with the help of shift registers.

Following are the four types of shift registers based on applying inputs and accessing of outputs.

- Serial In − Serial Out shift register.
- Serial In − Parallel Out shift register.
- Parallel In − Serial Out shift register.
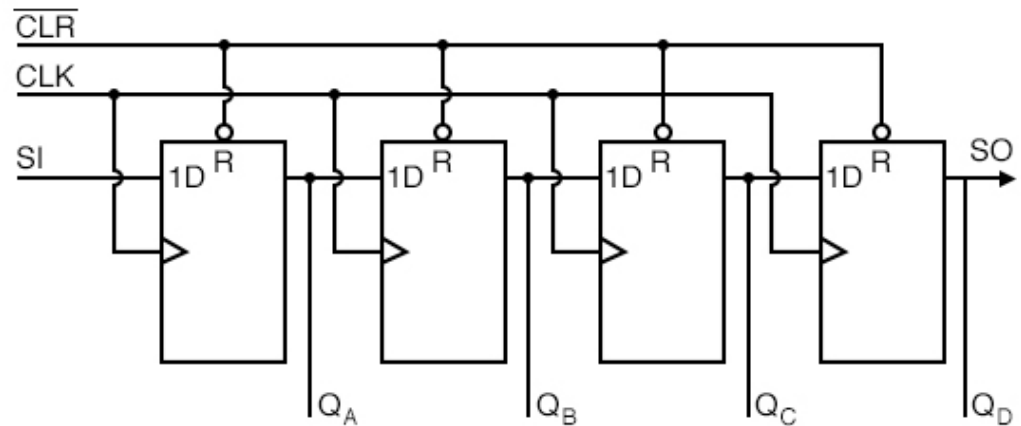- Parallel In − Parallel Out shift register.

Serial in serial out register

▶ Serial-in, serial-out shift registers **delay data by one clock time for each stage**. They will store a bit of data for each register. A serial-in, serial-out shift register may be one to 64 bits in length, longer if registers or packages are cascaded.
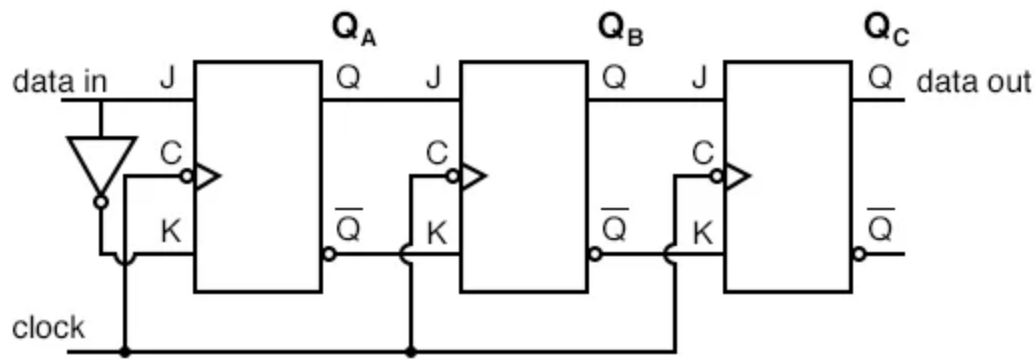
Serial-in, serial out shift register using type "**JK**" storage elements

Serial in parallel out register

▶ The serial-in parallel-out shift register is **used to convert serial data into parallel data** thus they are used in communication lines where demultiplexing of a data line into several parallel line is required. A Parallel in Serial out shift register us used to convert parallel data to serial data.
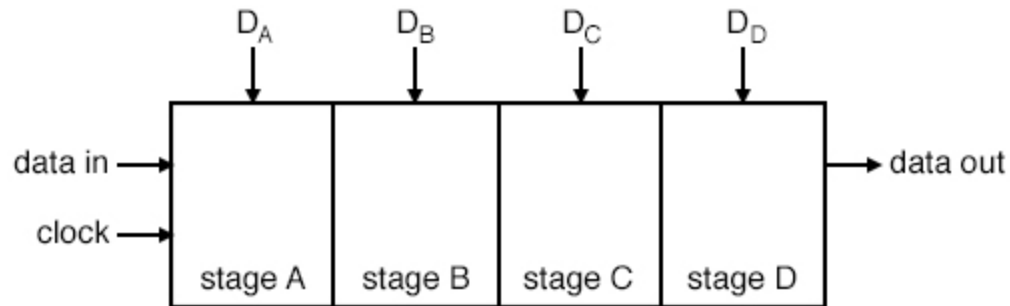

Serial-in/ Parallel-out shift register details

Parallel in Serial Out Register

- Parallel-in/ serial-out shift registers do everything that the previous serial-in/ serial-out shift registers do plus input data to all stages simultaneously.
- The parallel-in/ serial-out shift register stores data, shifts it on a clock by clock basis, and delays it by the number of stages times the clock period.
- In addition, parallel-in/ serial-out really means that we can load data in parallel into all stages before any shifting ever begins.
- This is a way to convert data from a *parallel* format to a *serial* format. By parallel format we mean that the data bits are present simultaneously on individual wires, one for each data bit as shown below.

(Cont.)

▸ By serial format we mean that the data bits are presented sequentially in time on a single wire or circuit as in the case of the "data out" on the block diagram below.

Parallel-in. serial-out shift register with 4-stages

Buffer register

▶ A memory buffer register is the register in a computer's processor, or central processing unit, CPU, that stores the data being transferred to and from the immediate access storage. It contains the copy of designated memory locations specified by the memory address register.
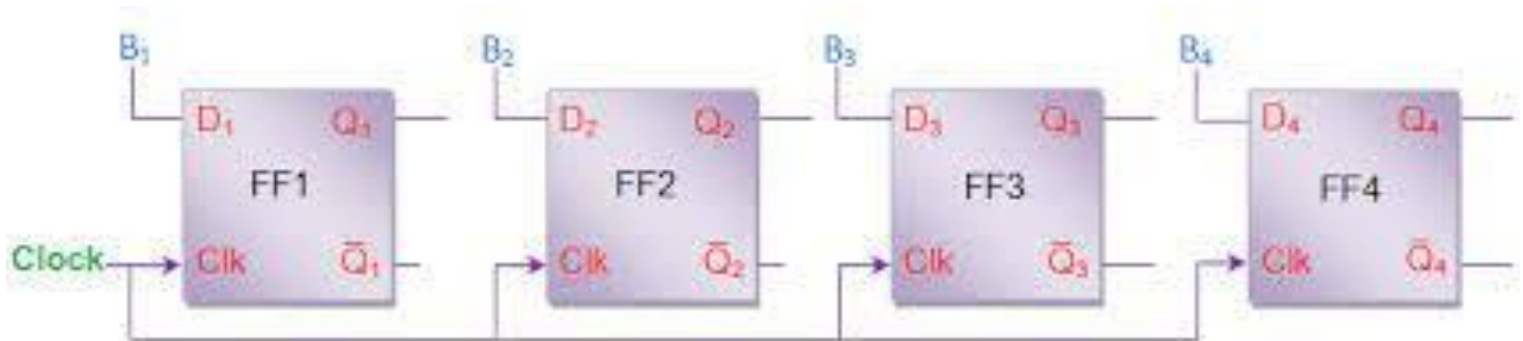

Figure 1   4-bit Buffer Register