Unit V

Shift Registers

by

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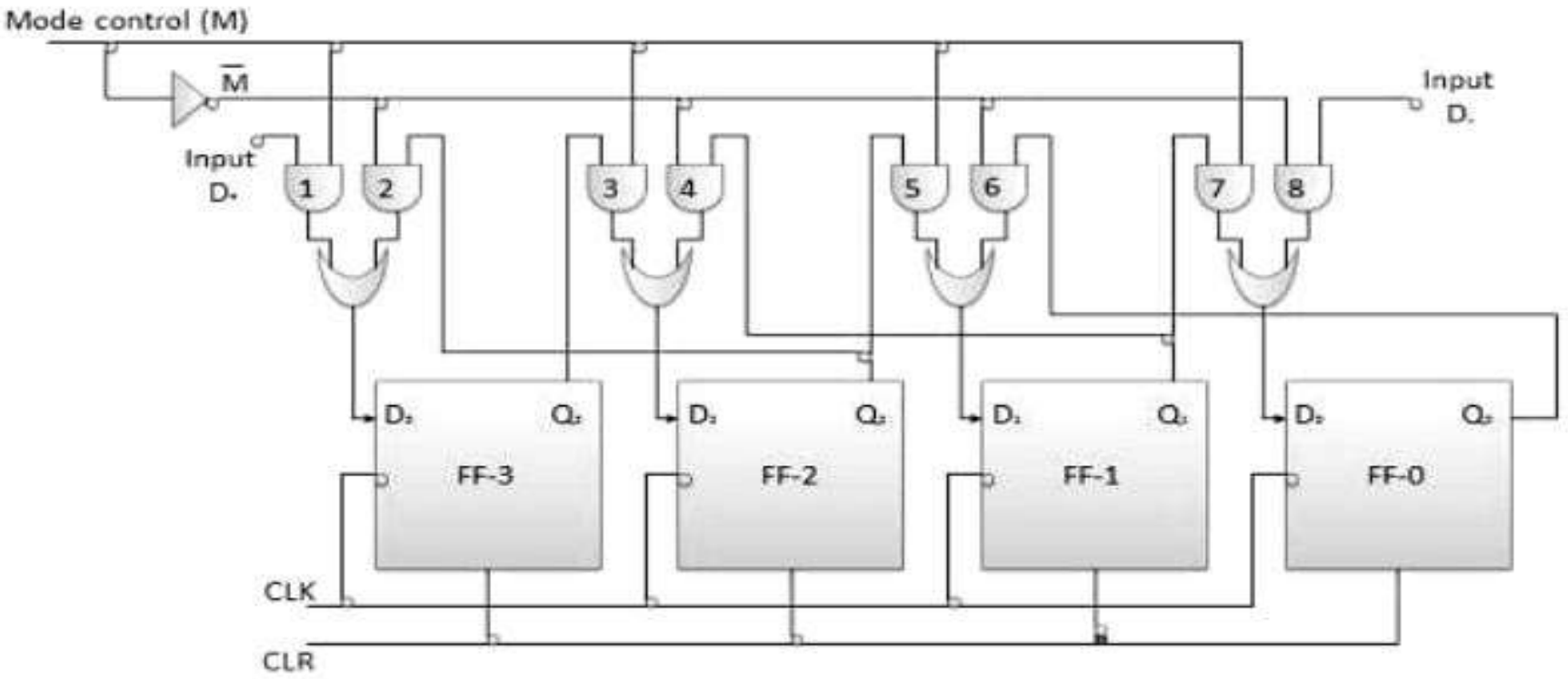
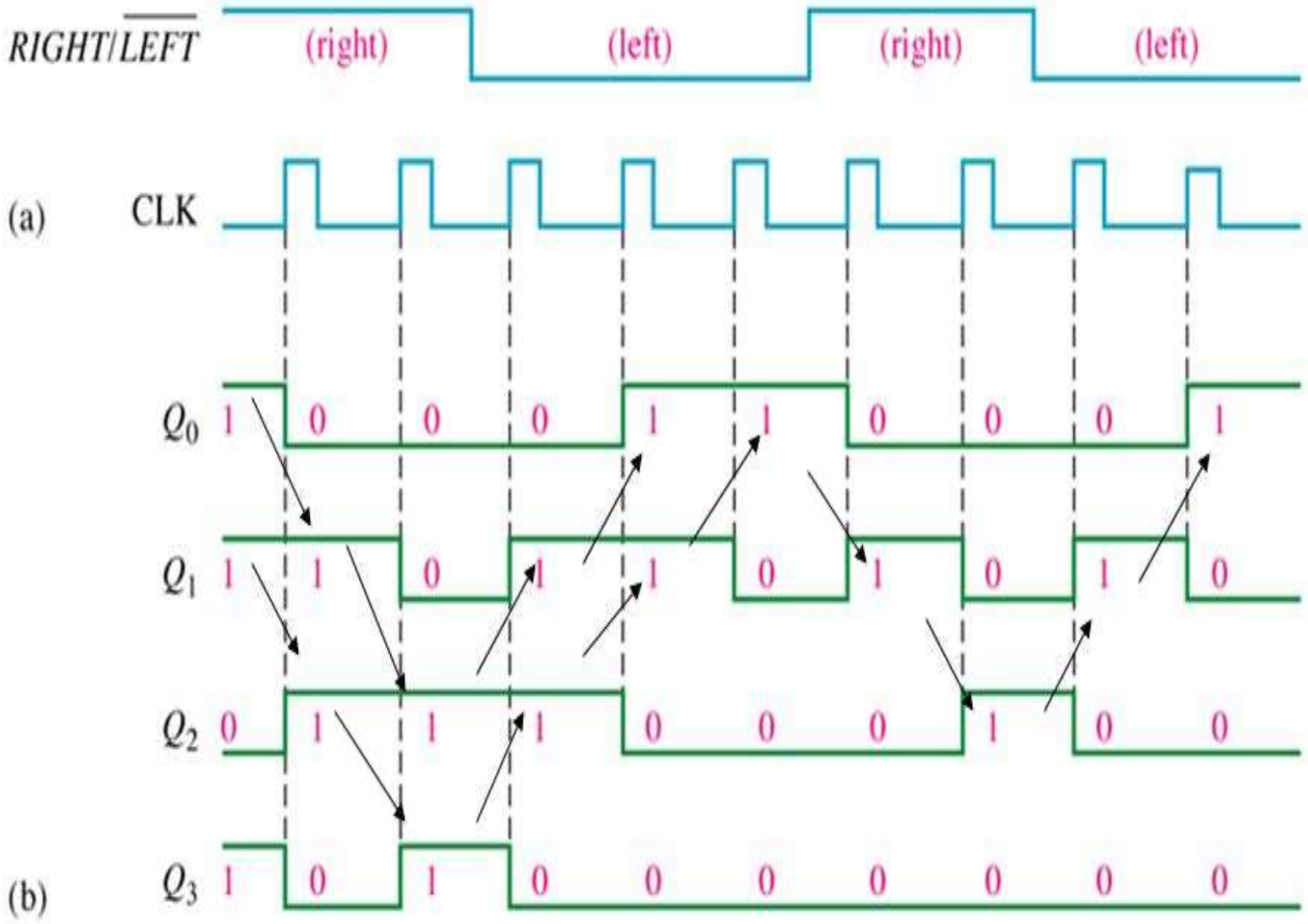
Bidirectional Shift Registers

- Data can be shifted either left or right, using a control line *RIGHT*/*LEFT* (or simply *RIGHT*) to indicate the direction.




RIGHT/LEFT
(right)
(left)
(right)
(left)
(a)
CLK
Q_0
Q_1
Q_2
Q_3
(b)

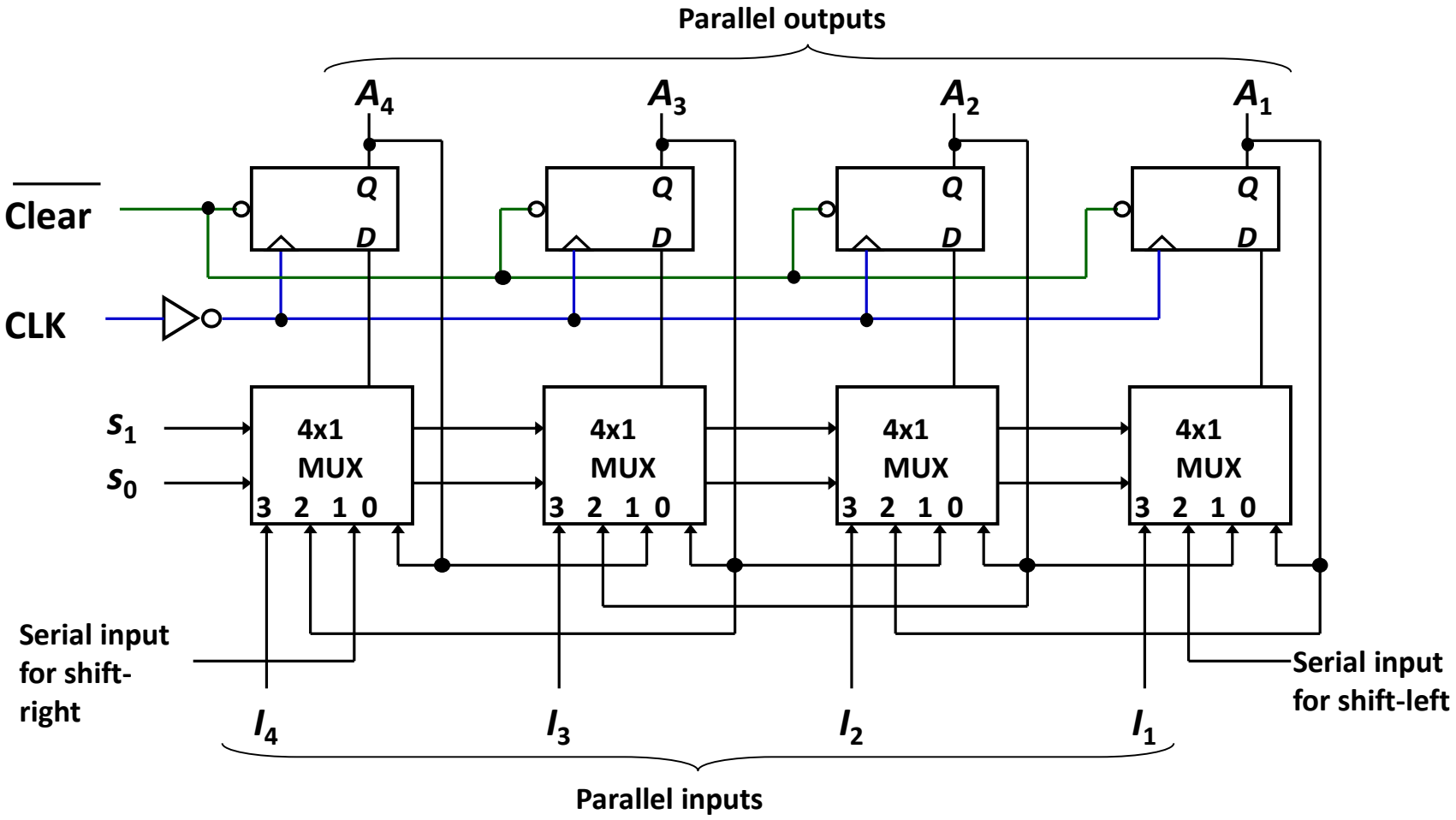
Bidirectional Shift Registers

- 4-bit bidirectional shift register with parallel load.

Mode Control		***Register Operation***
s_1	s_0	
0	**0**	**No change**
0	**1**	**Shift right**
1	**0**	**Shift left**
1	**1**	**Parallel load**

Bidirectional Shift Registers

- 4-bit bidirectional shift register with parallel load.

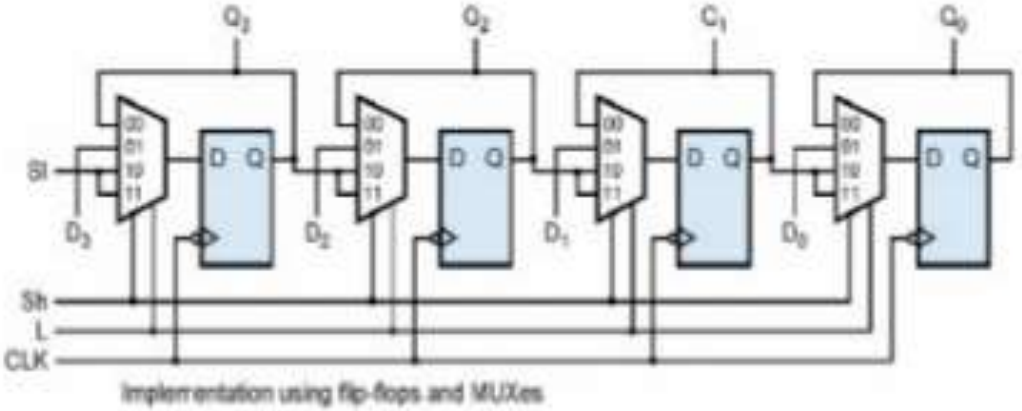


Basic connections

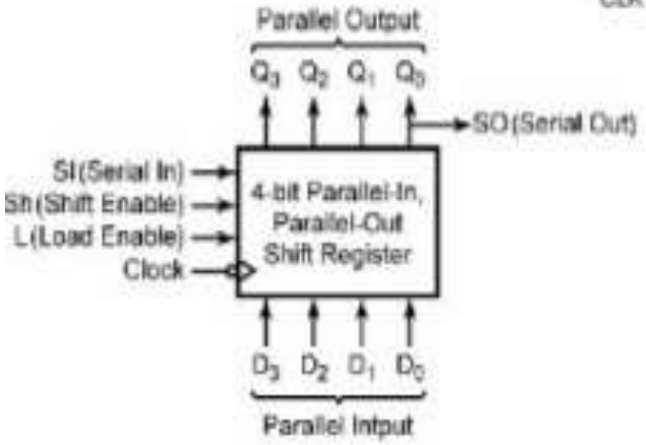
- The first input (zeroth pin of multiplexer) is connected to the output pin of the corresponding flip-flop.
- The second input (first pin of multiplexer) is connected to the output of the very-previous flip flop which facilitates the right shift.
- The third input (second pin of multiplexer) is connected to the output of the very-next flip-flop which facilitates the left shift.
- The fourth input (third pin of multiplexer) is connected to the individual bits of the input data which facilitates parallel loading.

Universal Shift Register

- Parallel shift register (can serve as converting parallel-in to serial-out shifter):



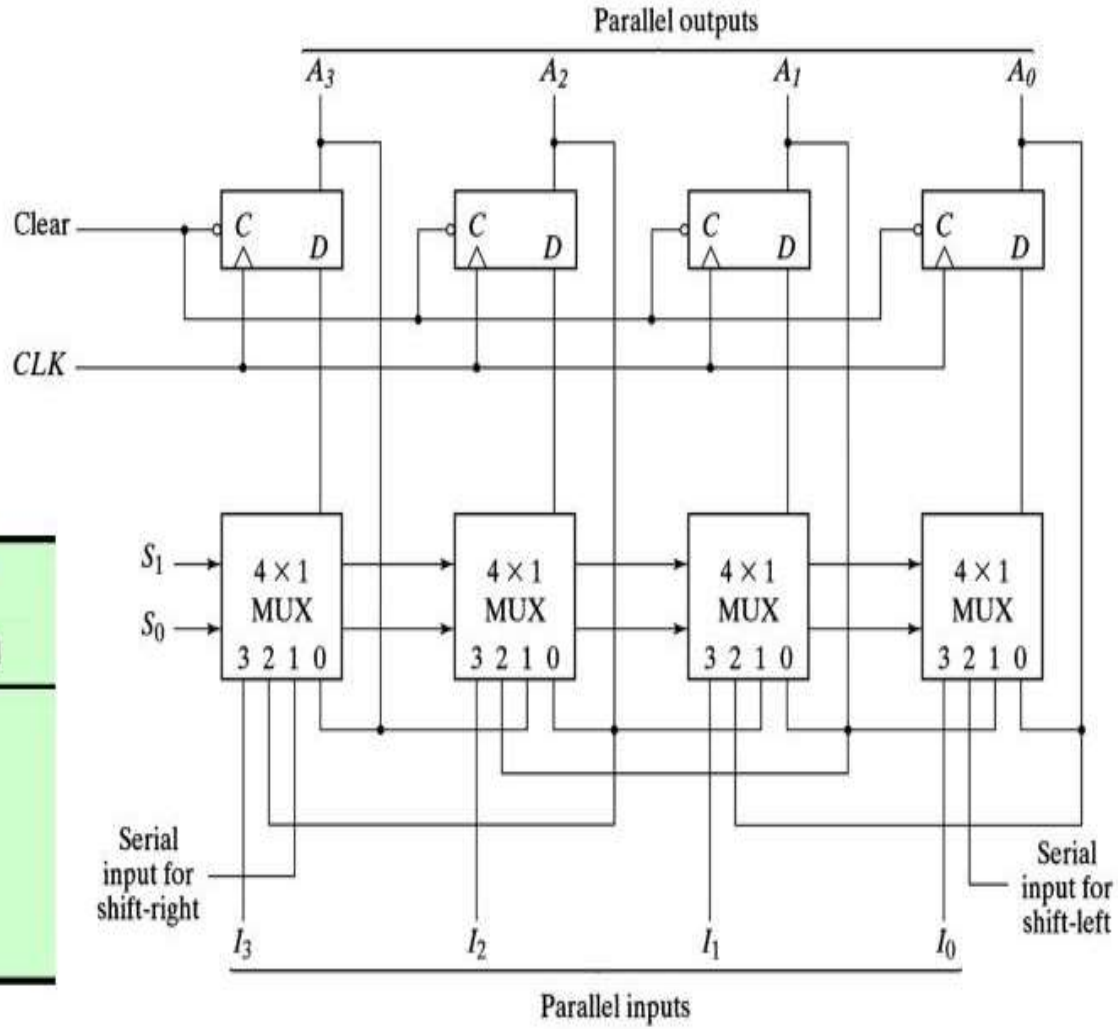
Implementation using flip-flops and MUXes



Inputs		Next State				Action
Sh (Shift)	Ld (Load)	Q_3^+	Q_2^+	Q_1^+	Q_0^+	
0	0	Q_3	Q_2	Q_1	Q_0	no change
0	1	D_3	D_2	D_1	D_0	load
1	X	SI	Q_3	Q_2	Q_1	right shift

Universal Shift Register

Mode Control		Register
S1	S0	Operation
0	0	No change
0	1	Shift right
1	0	Shift left
1	1	Parallel load



Advantages

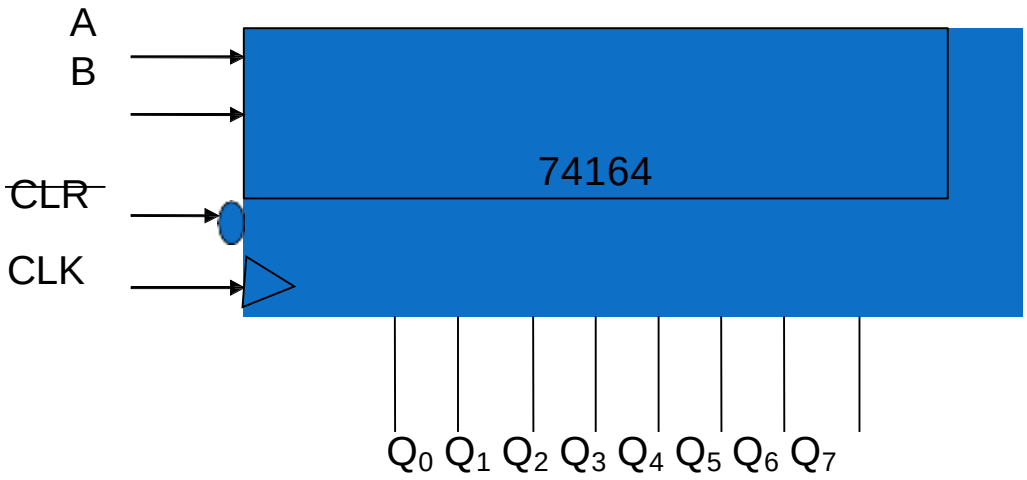
- The **advantages of a universal shift register** include the following.
- This register can perform 3 operations such as shift-left, shift-right, and parallel loading.
- Stores the data temporarily with in the register.
- It can perform serial to parallel, parallel to serial, parallel to parallel and serial to serial operations.
- It can perform input-output operations in both the modes serial and parallel.
- A Combination of the unidirectional shift register and bidirectional shift register gives the universe shift register.
- This register acts as an interface between one device to another device to transfer the data.

Applications

- Used in micro-controllers for I/O expansion
- Used as a serial-to-serial converter
- Used as a parallel-to-parallel data converter
- Used as a serial-to-parallel data converter.
- Used in serial – to – serial data transfer
- Used in parallel data transfer.
- Used as a memory element in digital electronics like computers.
- Used in time delay applications
- Used as frequency counters, binary counters, and Digital clocks
- Used in data manipulation applications.

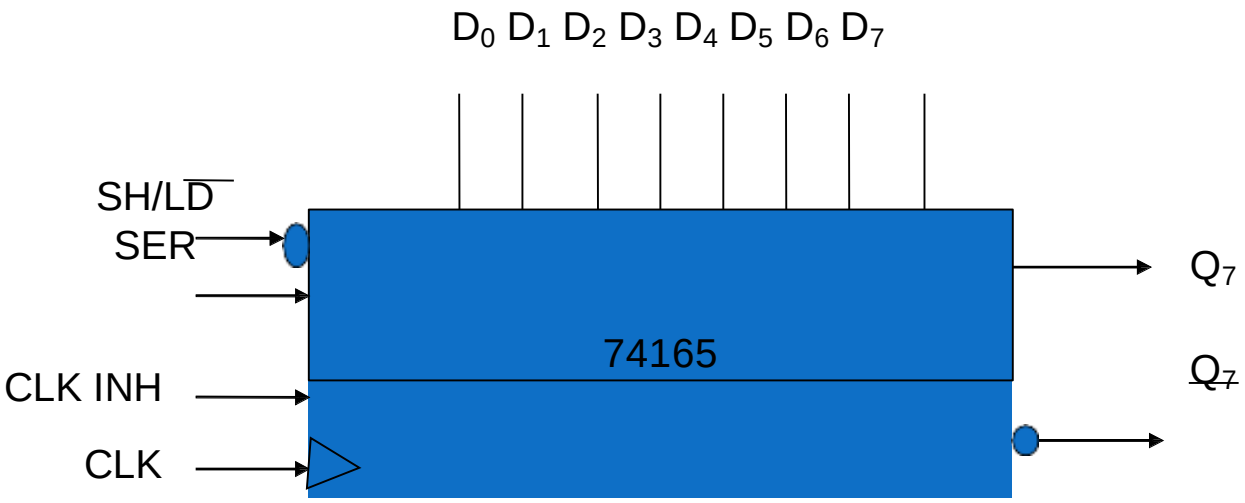
Integrated Circuits: Chips for shift registers

- 74164 is a 8-bit SIPO shift register



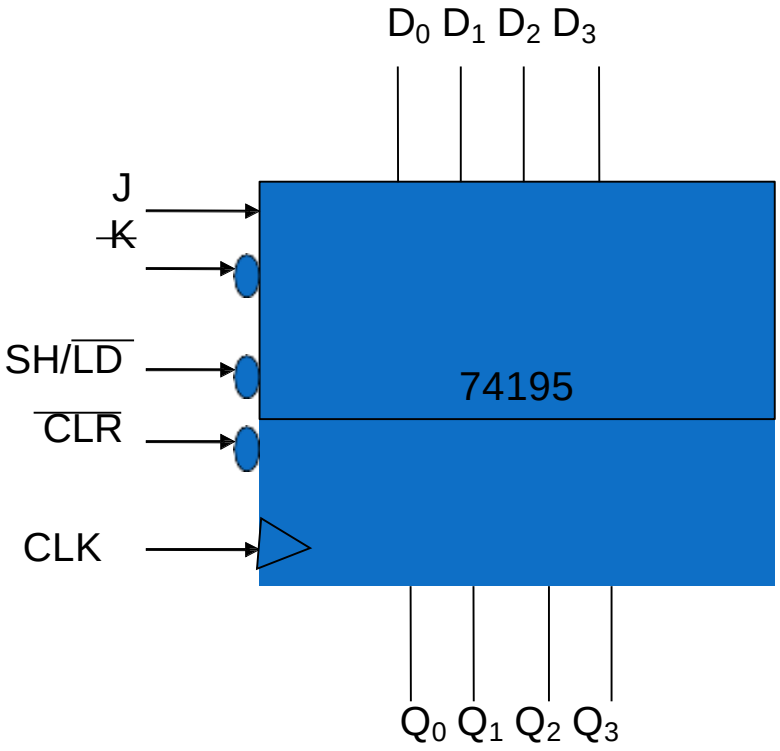
Chips for shift registers

- 74165 is a 8-bit PISO register



Chips for shift registers

- 74195 can be used as a 4-bit PIPO register



QUIZ

- In serial shifting method, data shifting occurs _____
-

  a) One bit at a time
  b) simultaneously
  c) Two bit at a time
  d) Four bit at a time

QUIZ

The main difference between a register and a counter is _____

a) A register has no specific sequence of states
b) A counter has no specific sequence of states
c) A register has capability to store one bit of information but counter has n-bit
d) A register counts data