Registers

Registers:- A register is a collection of flip-flop. A flip-flop is used to store single bit digital data. For storing a large no. of bits the storage capacity is increased by grouping more than one flip-flop. eg If we want to store an n-bit word, we have to use n-bit registers containing n no. of flip flop.

The binary data in a register can be moved within the register from one flip-flop to another. The registers that allow such data transfers are called as shift registers. Types of shift registers

i) Serial input serial output (SISO)
ii) Serial input parallel output (SIPO)
iii) parallel input serial output (PISO)
iv) parallel input parallel output. (PIPO).

Serial input serial output (SISO) register:- The register in which the data is entered in serially and taken out serially is called serial in serial out register (SISO).

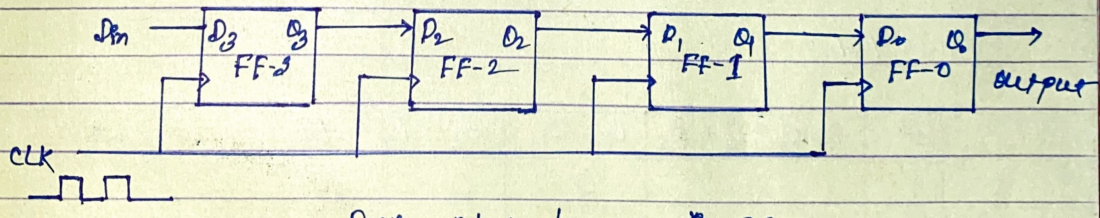


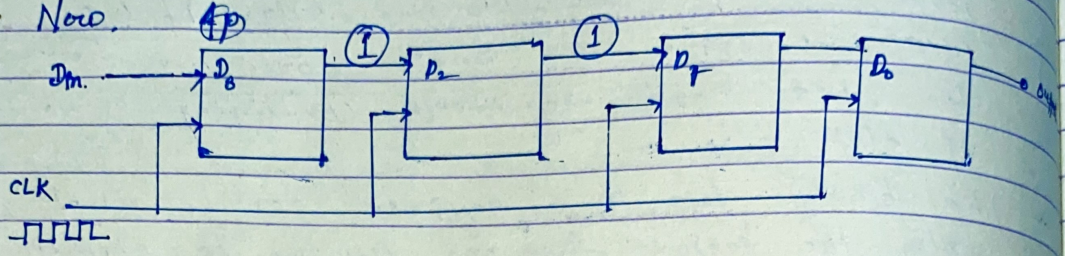
Fig: Block diagram of SISO

Operation:-

Let all the flip-flop be initially in the reset condition i.e $Q_3 = Q_2 = Q_1 = Q_0 = 0$. If an input data 1111 applied to the Din of register so. Din = 1. $D_{in} = D_3 = 1$. Now apply the clock. On the first falling edge of clock the FF-3 is set and the stored word in the register is $1000 = Q_3 Q_2 Q_1 Q_0$

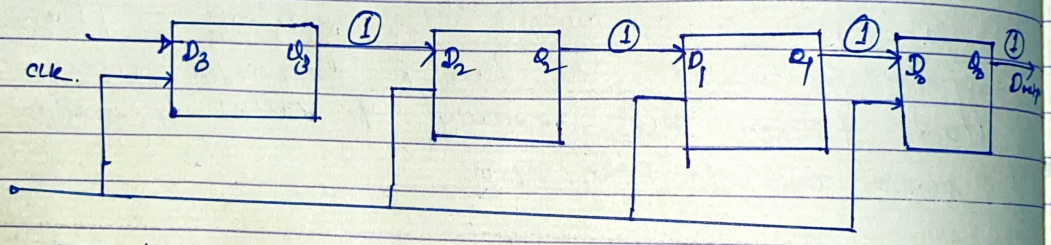
Apply the next bit to $D_{in} = 1$. As soon as the next negative edge of clock hits, FF-2 will set and the stored word is changed to $Q_3 Q_2 Q_1 Q_0 = 1100$.

Now.



Now, apply the next bit to be stored i.e 1. Apply the next clock pulse. As soon as the third negative clock edge hits, FF-1 will be set and output to be modified to $Q_3 Q_2 Q_1 Q_0 = 1110$.

Similarly, with $D_{in} = 1$ on fourth falling edge of -ve clock edge: the output gets modified.



Truth table:

CLK	$D_{in} = Q_3$	$D_2 = Q_3$	$Q_2 = D_1$	$Q_1 = D_0$	Q_0
		0	0	0	0
↓	1 → 1		0	0	0
↓	1 → 1	→ 1		0	0
↓	1 → 1	→ 1	→ 1		0
↓	1 → 1	→ 1	→ 1	→ 1	→ 1

Fig: Direction of data travel

Waveform

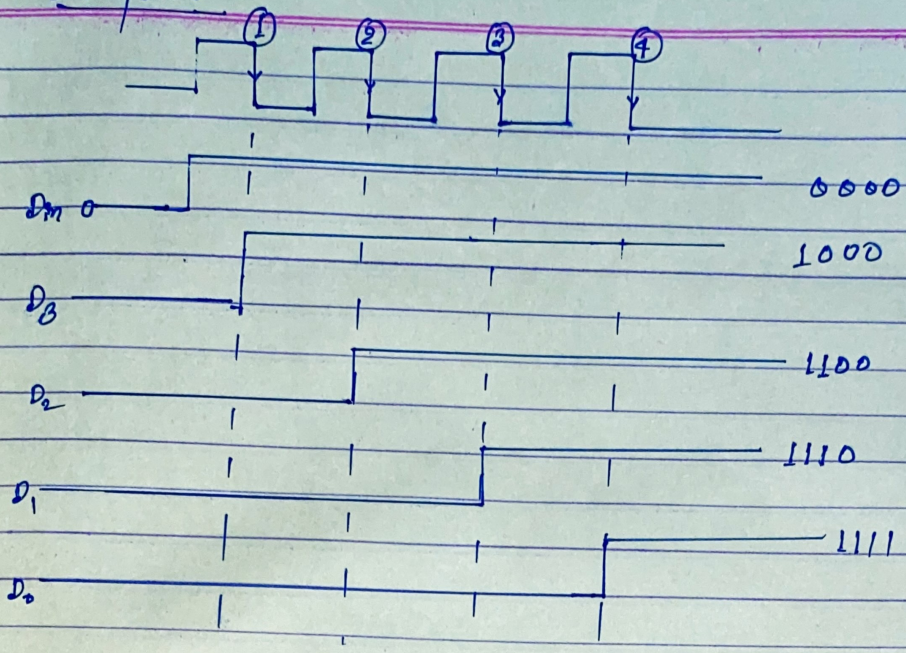


Fig: Operational waveform of SISO.