Dr. Annu Kumari
Dept. of Physics
H. D. Jain College, Ara

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Paper - CC 12

unit - 5

Topic - D type flip flop, T- type flip flop

The D- type flip-flop - In this type of flip-flop, there is no possibility of ambiguous state. This is achieved by providing J-K, flip-flop with an inverter on one of the input lines. Thus only one data input (D) to the flip flop is necessary. Its symbol is shown in fig 3.

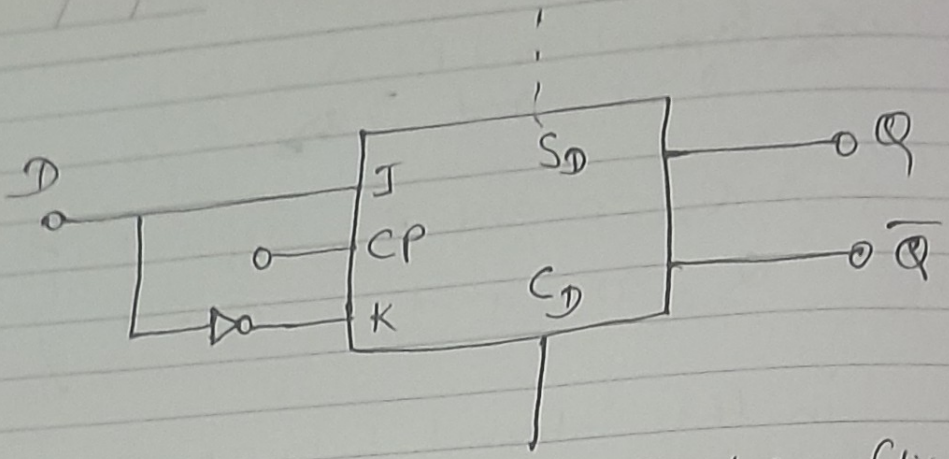


fig 3. Symbol of D-type flip flop.

If D=1 (and Q=0) then Q does not become 1 until CP=1. That is, the output after CP, equals the input at D before CP. Therefore it is thought of as a delay (D) type of flip flop. The bit on D line is transferred to the output at the next clock pulse and hence this unit fun's as a 1-bit delay device and is used as a temporary storage device. It is known as a 1-bit bistable latch.

J-K flip-flop :- fig 4(a) shows the block diagram symbol and truth table of a J-K flip flop. It is simply an R-S flip flop with two AND gates at the inputs. We note that there are cross connections from output to J-K inputs,

$\overline{Q}$ is connected to J input while Q is connected to K input. Its effect is that it provides a means of steering 1-1 input to the necessary S or R terminal to provide a

change of state at the output. For example, suppose before CP is applied.

$Q = 1$, and $\bar{Q} = 0$ and 1-1 input at J and K

then, as they are AND gates, at the input of J gate is 1, 0; K gate is 1, 1 so that at outputs of these gates,

S will be 0 (low); R will be 1 (high)

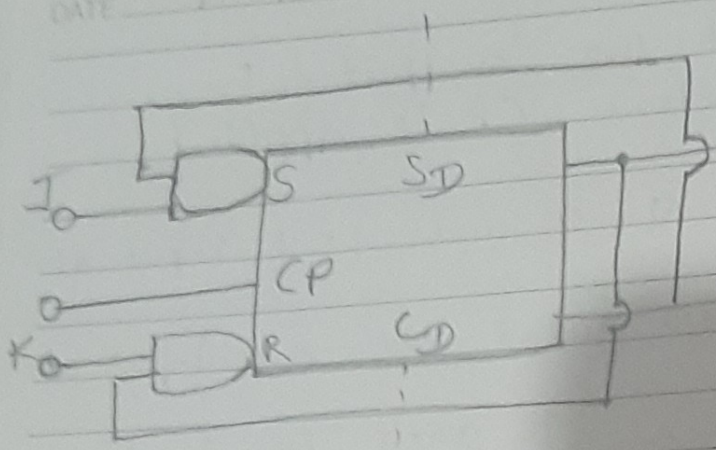
and when the next clock pulse arrives, this will make the outputs of flip-flop

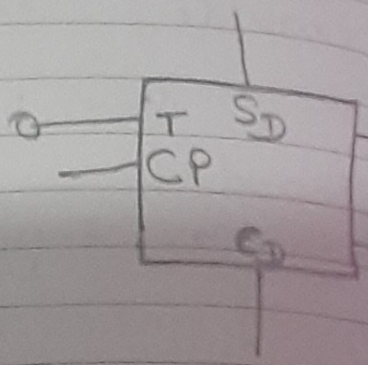
$Q = 1$ and $\bar{Q} = 1$

Thus a change of state has occurred. It means state will change each time CP appears if $J = K = 1$, i.e, flip flop toggles from one state to the other at each CP. This property makes it very useful in counting applications. Thus if $J = K = 1$, then

$Q_{n+1} = \bar{Q}_n$ so that J-K flip-flop is converted into a <u>T-Type flip-flop</u>.

In fig 4(b) such a flip-flop is indicated with a data input T. We shall use it in ripple (asynchronous) counters in counters.





(b) Symbol

4 (a) Block diagram

J	K	Q_{n+1}
0	0	Q_n
0	1	0
1	0	1
1	1	$\bar{Q}_n$

(c) Truth table