Lecture -16

Flip-Flop application:

Parallel Data Storage

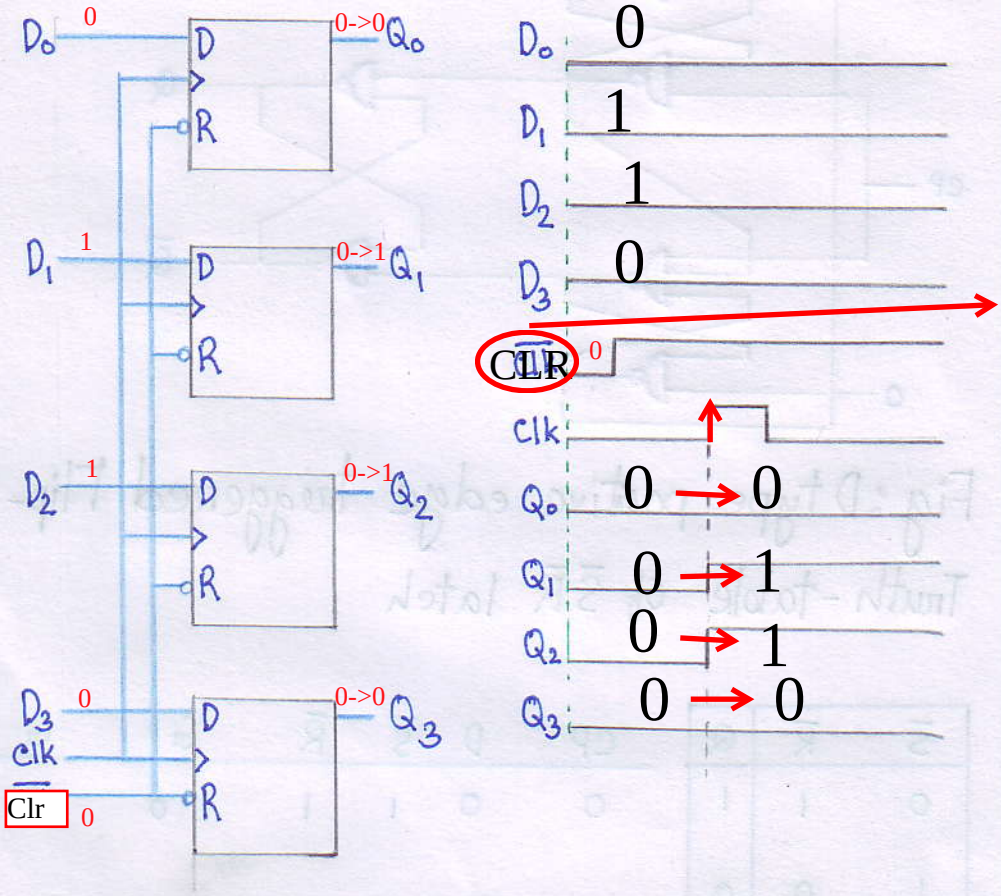
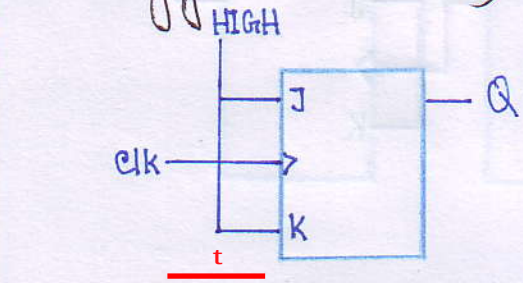


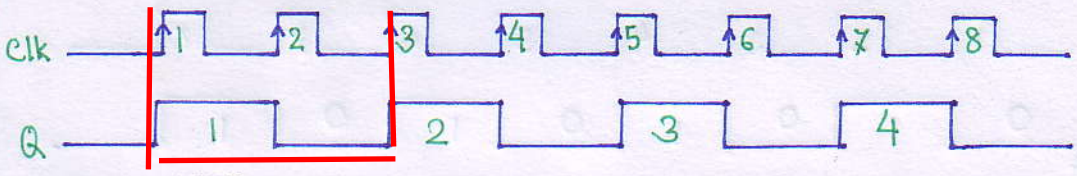
Fig: Flip-Flops used for parallel data storage

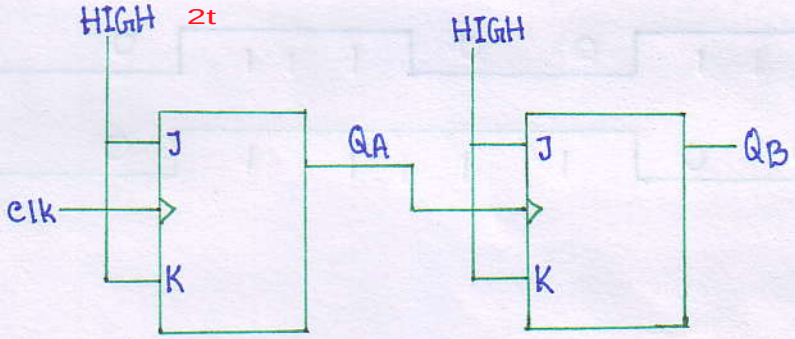
Frequency Division:

A J-K Flip-Flop can be used to divide the frequency of a clock by 2 when connected to toggle (J=k=1)



f=1/t



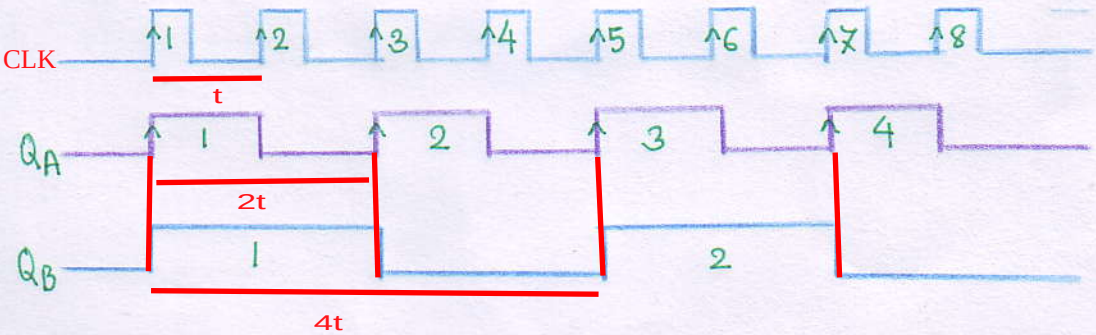


Flip-Flop A

Flip-Flop A will toggle at the positive edge of CLK

Flip-Flop B

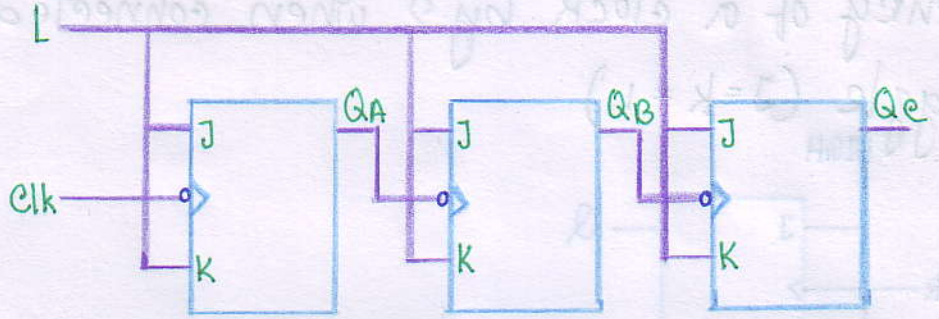
Flip-flop B will toggle at the positive edge of QA

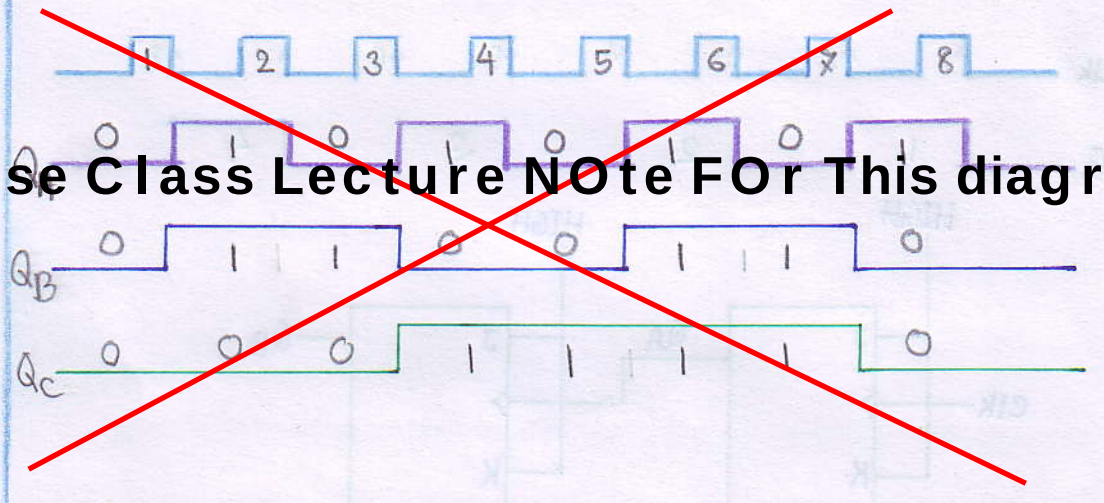


time period of QB= 2 times of time period of QA and = 4 times of time period of CLK

time period of QA= 2 times of time period of CLK

f=1/t





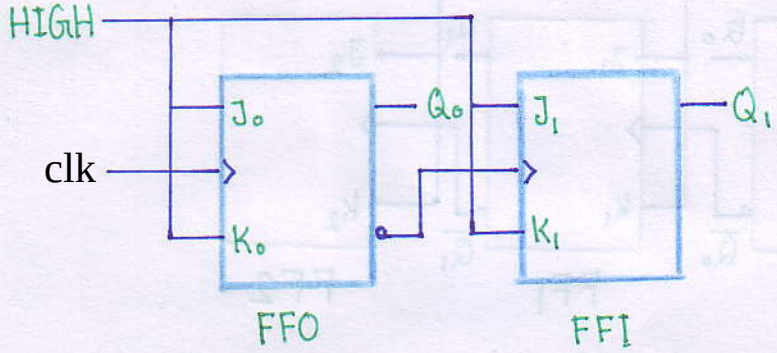
Use Class Lecture NOte FOr This diagram

A synchronous Counter Operation:

A 2-bit Asynchronous Binary Counter

J0 and K0 will always toggle at the rising edge of clk

J1 and K1 will always toggle at the rising edge of $\overline{Q0}$



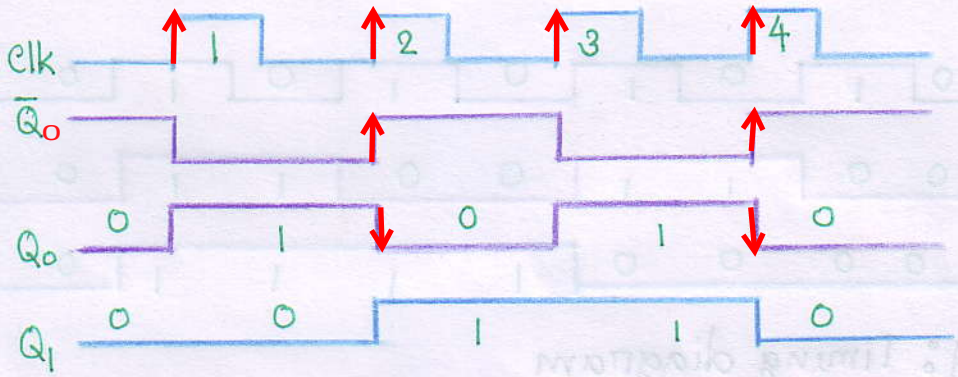
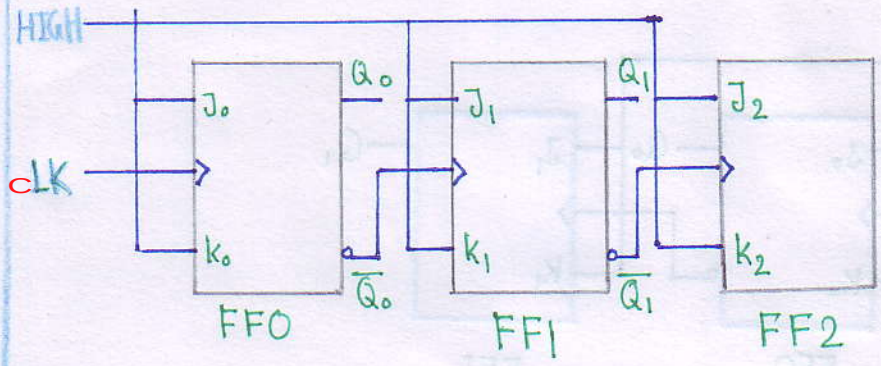


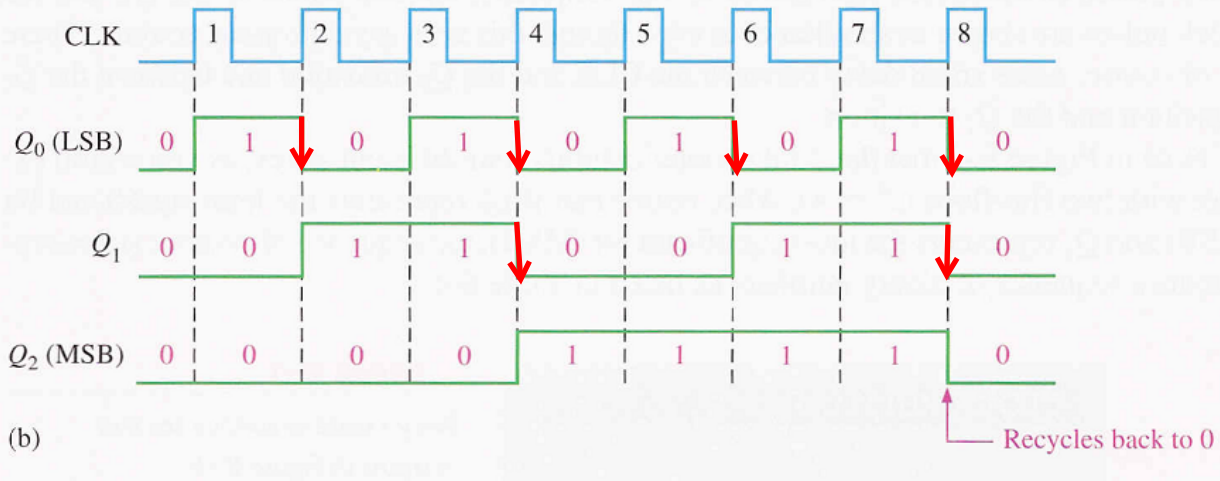
Fig: Timing diagram for the counter

Clock pulse	Q_1	Q_0
Initially	0	0
1	0	1
2	1	0
3	1	1
4(recycles)	0	0

Table state sequance for a 2-stage binary counter.

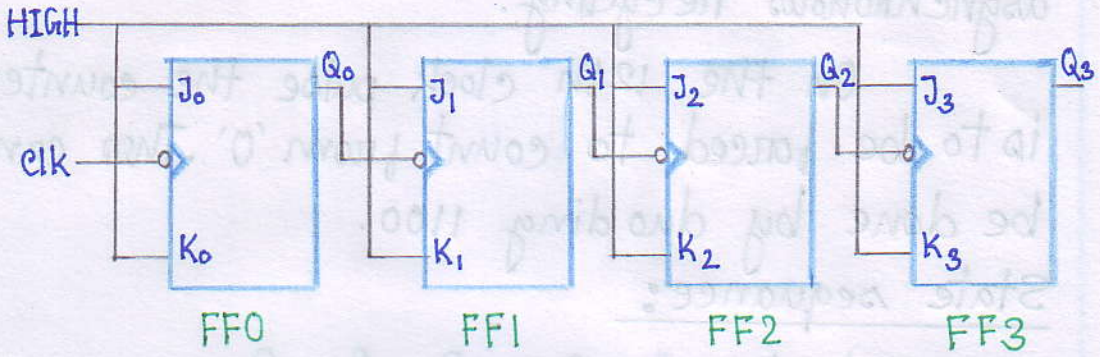
A 3-Bit Asynchronous Binary counter





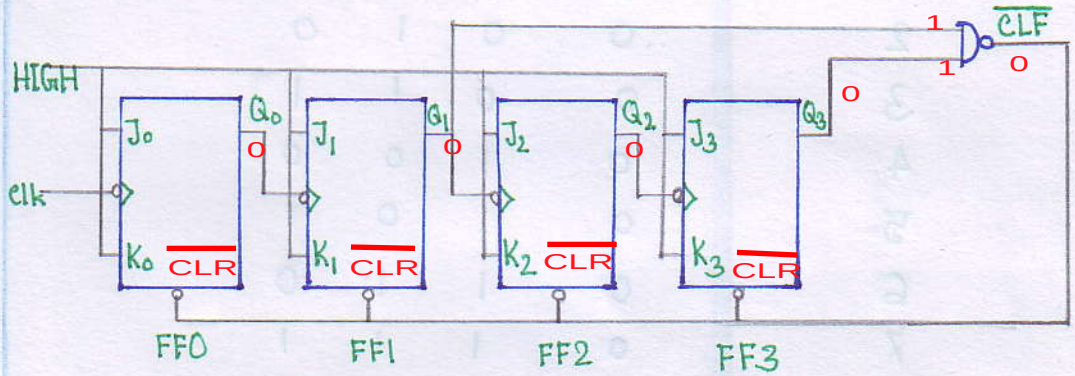
Clock pluse	Q_2	Q_1	Q_0
Initially	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1
8 (recyles)	0	0	0

A Four bit Asynchronous binary counter



Asynchronous Decade counter :

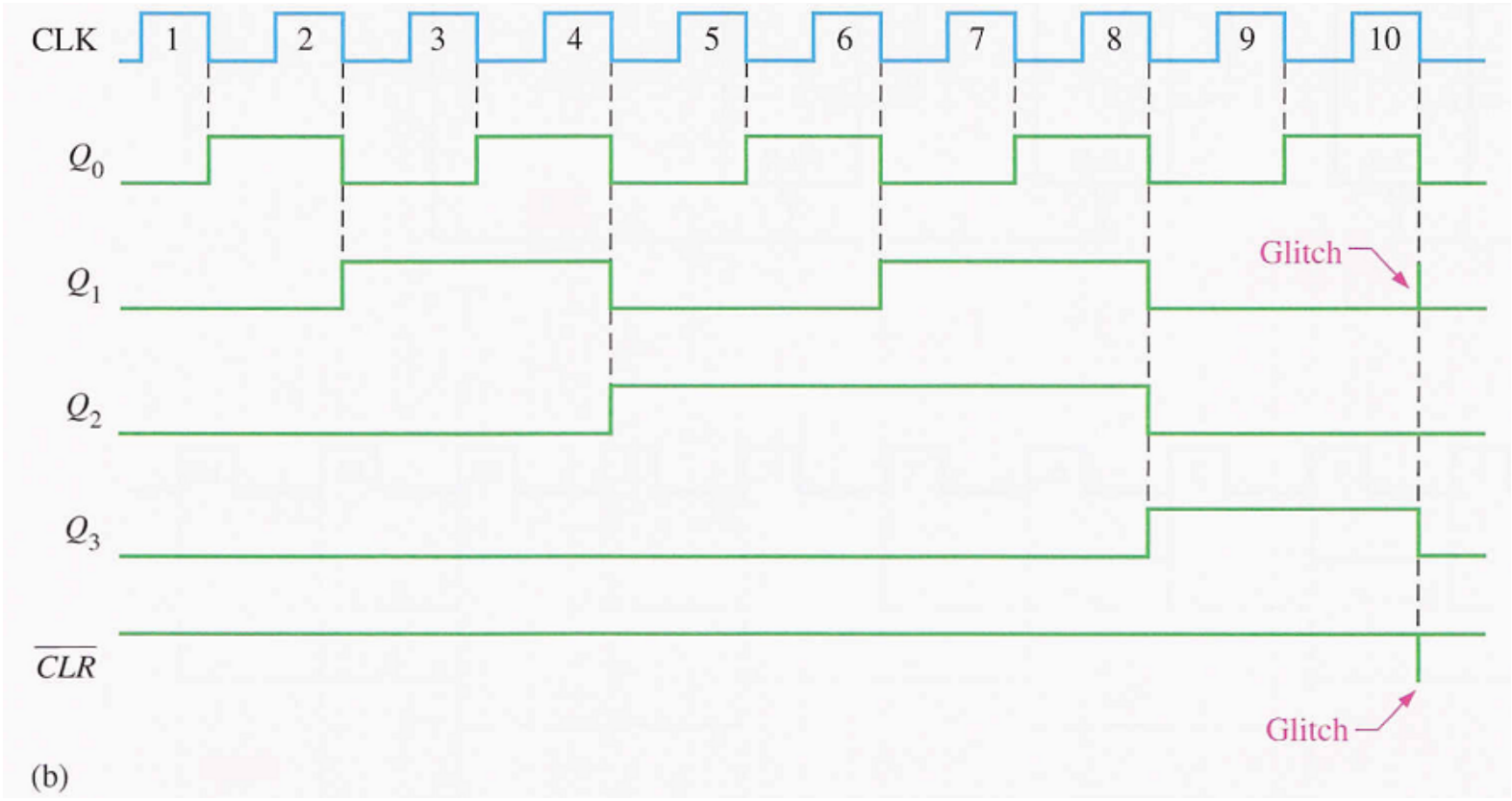
MODULUS-10



State sequance for an asynchronous decode counter :

Clock pulse	Q_3	Q_2	Q_1	Q_0
Initially	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
	0	0	0	0

A decade counter is going to count upto binary value of 0-9. It will recycle at the 10th Clock pulse, and you will only see a slight glimpse of the value 10, after which it will show 0 (that means it will recycle).



(b)