VIVEKANANDA COLLEGE
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NAAC ACCREDITED 'A' GRADE

Topic: counter

Course Title: Digital Electronics and VHDL

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Counter :-

A counter is a sequential circuit that keeps a record of the clock pulses sent through it. Like a register, a counter also consists of flip-flops and some extra logic gates or combinational circuits. The bits of the binary sequence are nothing but the output of the flip-flops and changes of the binary sequence from one to another is controlled by the clock input to the flip-flops.

Counters are classified into three categories :-

i) Asynchronous Counter
ii) Synchronous Counter
iii) Hybrid Counter.

→ Asynchronous Counter :-

In asynchronous counters, all the flip flops in the counter are not triggered by the same source of clock. A special class of this asynchronous counter are called "ripple counter" where one flip flop is triggered by the external clock and the other flip-flops are triggered not by the external clock but by

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the transition of Q-output of the adjacent lower significant flip-flops. The position of the flip-flop which is driven by the external clock is the least significant position.

→ Binary up ripple counter :-

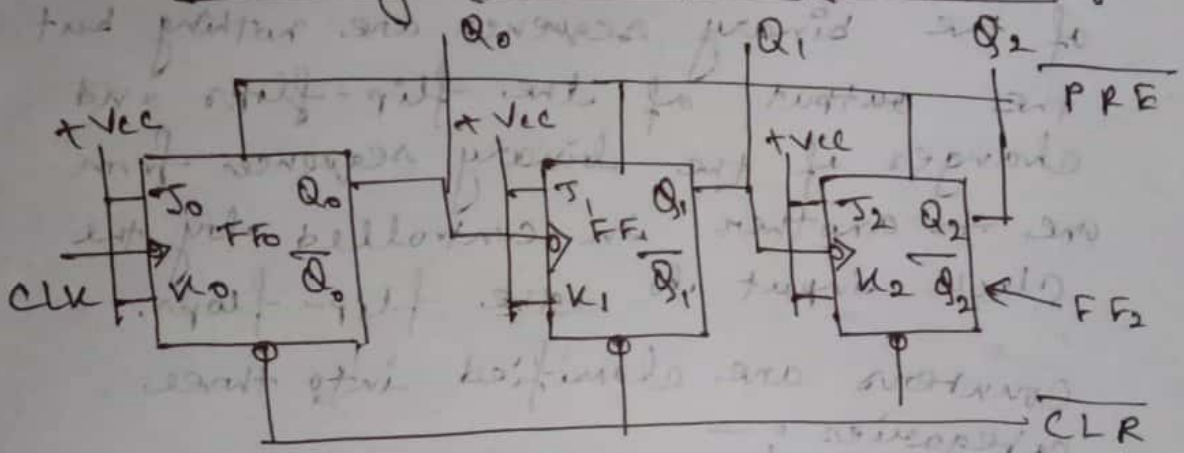

fig shows the circuit of a three bit asynchronous Binary-up-ripple counter. In this circuit all J-K inputs are connected to +Vcc and the clock inputs are negative edge triggered.

In the circuit the flip flop FF0 receives clock from an external clock but the clock input of following flip-flops receive Q-output of the adjacent preceding flip-flop.

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As the clock input of J-K flip-flo of this circuit are negative edge sensative so the output Q_0 to FFs will toggle each time are negative edge of external clock.

The count sequence of this counter →

Q_2	Q_1	Q_0		Decimal equivalent of count output.
0	0	0	↓	$(0)_{10}$
0	0	1	↓	$(1)_{10}$
0	1	0	↓	$(2)_{10}$
0	1	1	↓	$(3)_{10}$
1	0	0	↓	$(4)_{10}$
1	0	1	↓	$(5)_{10}$
1	1	0	↓	$(6)_{10}$
1	1	1	↓	$(7)_{10}$
0	0	0		$(0)_{10}$

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