BISTABLE MULTIVIBRATOR

BISTABLE MULTIVIBRATOR
LECTURE-4
TDC PART I
PAPER II (GROUP- B)
CHAPTER 3
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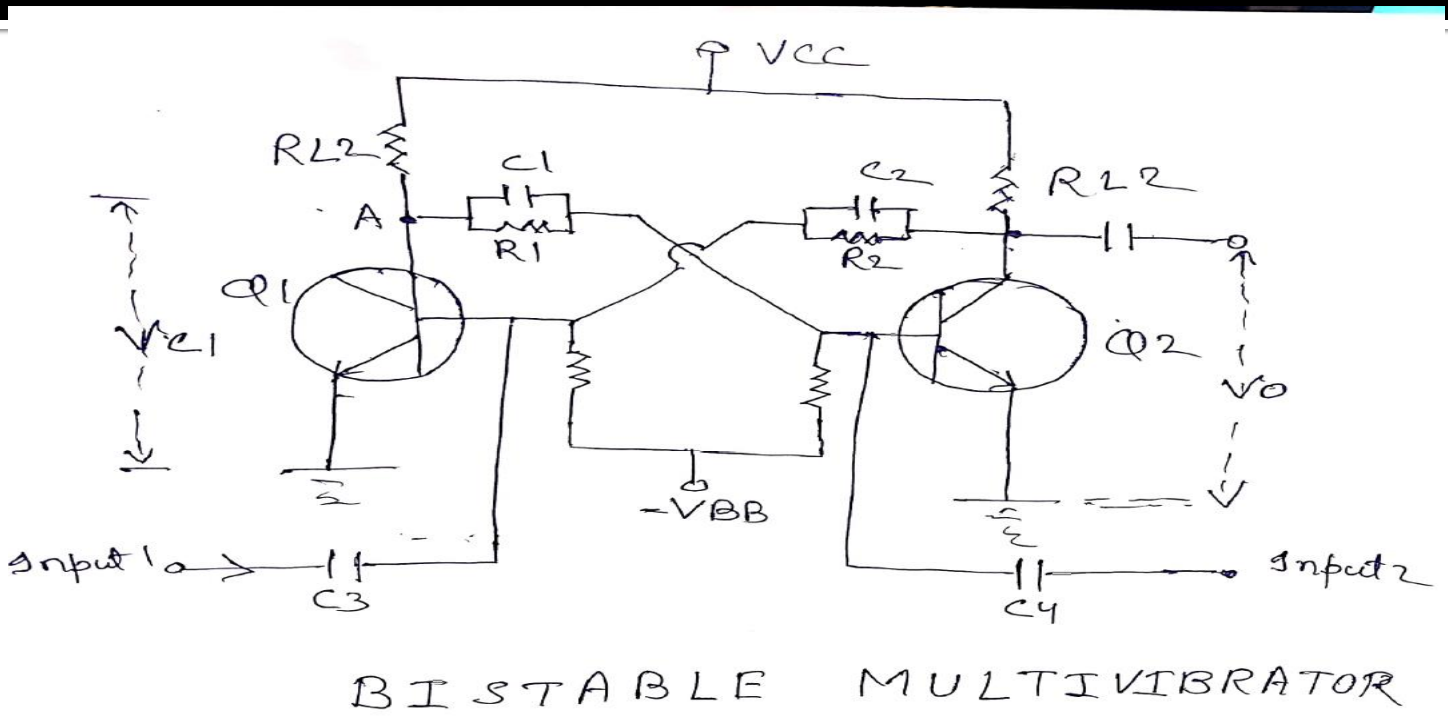
BISTABLE MULTIVIBRATOR

Bistable Multivibrator have two stable states and maintain a given output state indefinitely unless an external trigger is applied forcing it to change state. Thus a bistable multivibrator requires two external trigger pulses before it returns back to its original state. To change the bistable multivibrator from one state to the other, the bistable circuit requires a suitable trigger pulse and to go through a full cycle, two triggering pulses, one for each stage are required.

It is more commonly named or termed as “flip flop”. It relates to the actual operation of the device, as it “flips” into one logic state, remains there and then changes or “flops” back into its first original state. Bistable multivibrator can be designed using transistors or operational amplifiers or 555 timer ICS along with passive components, the registers.

BISTABLE MULTIVIBRATOR

(Diagram)



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The following figure shows the circuit diagram of a self biased bistable multivibrator.

BISTABLE MULTIVIBRATOR
(Construction)

Two similar transistors Q1 and Q2 with load registers RL1 and RL2 are connected in feedback to one another. The base registers R3 and R4 are joined to a common source – VBB. The feedback resistors R1 and R2 are shunted by capacitors C1 and C2 known as commutating capacitors.

The transistor Q1 is given a trigger input at the base through the capacitor C3 and the transistor Q2 is given a trigger input at its base through capacitor C4.

The capacitors C1 and C2 are also known as speed up capacitors, as they reduces the transition time, which means the time taken for the transfer of conduction from one transistor to the other.

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(Operation)

When the circuit is switched on, due to some circuit imbalances transistor Q1 gets switched on, while the transistor Q2 gets switched off. This is a stable state of the bistable multivibrator.

By applying a negative trigger at the base of transistor Q1 or by applying a positive trigger pulse at the base of transistor Q2, this stable state is unaltered. So, let us understand this by considering a negative pulse at the base of transistor Q1. As a result, the collector voltage increases which forward biases the transistor Q2.

The collector current of Q2 as applied at the base of Q1, reverse biases Q1 and this cumulative action, makes the transistor Q1 OFF and the transistor Q2 ON. This is another stable state of the multivibrator.

Now, if this stable state has to be changed again then either a negative trigger pulse at transistor Q2 or a positive trigger pulse at transistor Q1 is applied.

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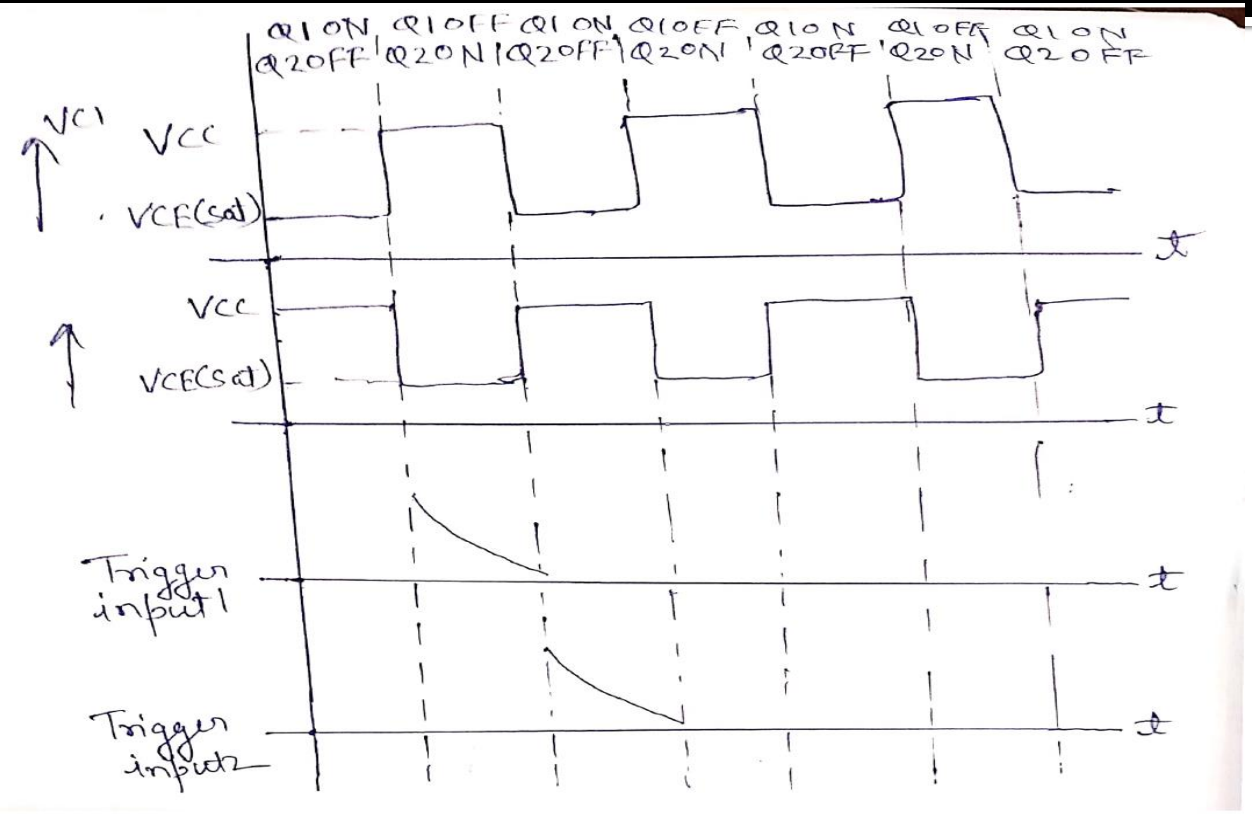
(Output Waveforms)



The output waveforms at the collectors of Q1 and Q2 along with the trigger inputs given at the basis of Q1 and Q2 are shown in figure 1.

BISTABLE MULTIVIBRATOR

(Applications)

Bistable multivibrator has many applications producing a set-reset, SR flip-flop circuit for use in counting circuits, or as a one bit memory storage device in a computer . Other applications of bistable flip-flop include frequency divider because the output pulses have a frequency that are exactly one half that of the trigger input pulse frequency due to the changing state from a single input pulse. In other words the circuit produces frequency division as it now divides the input frequency by a factor of two.

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(Advantages & Disadvantages)

ADVANTAGES

- It has the ability to store previous output until no any iutput trigger is provided.
- The circuit design is not complex.

DISADVANTAGES

- Every time in order to have transition from one state to another, triggering pulse is required.
- It is somewhat costly than a stable and monostable multivibrator.