Waveform Generation

Lecture - 15

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B.Sc (Electronics)

TDC PART - III

Paper – 6

Unit – 8

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➢ Introduction of Transistor Bi-Stable Multivibrator (PART – 1)

⇨ It is also called **Eccles-Jordan** or **Flip-Flop Multivibrator**. It has two absolutely stable states. It requires the application of an external triggering pulse to change the operation from either one state to the other. It can remain in either of these two states unless an external trigger pulse switches it from one state to the other. Thus one pulse is used to generate half-cycle of square wave and another pulse to generate the next half-cycle of square wave. It is **also known as a Flip-Flop Multivibrator** because of the two possible states it can assume. Obviously, it does not oscillate. **It has no Energy Storage Element (Capacitor).**

⇨ A **multivibrator** which has **Two Absolutely Stable States,** hence the name **"Bi" meaning two,** is called a **Bi-stable Multivibrator (BMV).** The bi-stable multivibrator has two stable states. Both are the absolutely stable states. It will remain in whichever state it happens to be until a trigger pulse causes it to switch to the other state. It requires the application of an **external triggering pulse** to change the **Bi-stable Multivibrator** operation from either **One Stable state to the Other Stable State.** Again another **trigger pulse** is then required to **switch the Bi-stable Multivibrator back** to its **First Initial Stable State** (**original state).**

⇨ The discrete **Bi-stable Multivibrator** is a **two state Non-Regenerative Device** constructed from **two cross-coupled transistors** operating as **"ON-OFF**" transistor switches. In each of the two states, one of the transistors is **cut-off** while the other transistor is in **saturation (ON),** this means that the **Bi-stable Circuit** is capable of **remaining indefinitely in either stable state.**

⇨ To change the **Bi-stable** over from one state to the other, the **Bi-stable circuit requires** a **suitable trigger pulse** and to go through a **full cycle**, two triggering pulses, one for each stage are required. Its **more common name or term of "Flip-Flop**" 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.**

⇨ The **basic Transistor Version Bi-stable Multivibrator** circuit diagram is **shown below in Figure (1).** For instance, suppose at any particular instant, **Transistor Q1** is **CONDUCTING (ON)** and **Transistor Q2** is at **CUT-OFF. It is First Initial Stable State.** If left to itself, the **Bi-stable Multivibrator** will stay in this position forever.

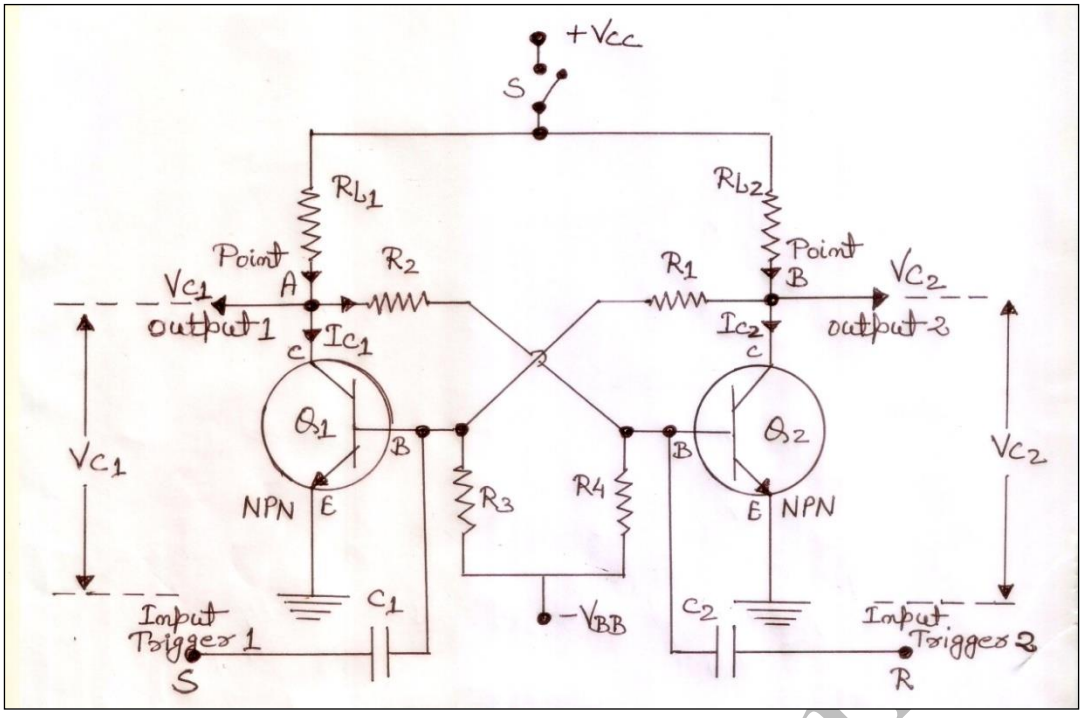

Fig. (1) Shown a Basic Transistor Bi-stable Multivibrator (BMV) Circuit Diagram.

⇨ However, if an **external trigger pulse** is applied to the circuit in such a way that **Transistor Q1 is CUT-OFF** and **Transistor Q2 is turned CONDUCTING (ON)**. **It is second stable state.** Again, if left to itself, the circuit will **stay in the new position (Second stable state).** Another **external trigger pulse** is then required to **switch the BMV circuit back** to its **First Initial Stable State** (**original state).** Thus one trigger pulse is used to generate **half-cycle of output square wave** and another trigger pulse to generate the **next half-cycle of output square wave. It is also known** as a **Flip-Flop Multivibrator** because of the **two possible Absolutely Stable states** it can assume.

⇨ **BMV** is also called **Eccles-Jordan** or **Flip-Flop Multivibrator**. The **basic Transistor Bistable Multivibrator** circuit diagram is **shown above in Figure (1),** as stated earlier, it has **two absolutely stable states**, hence the **name bistable multivibrator**.

⇨ It can be **'FLIPPED' or switch** from **one state** to **another** by **external trigger pulses** and the **next trigger pulse** causes it to **'FLOPPED'** back to its **original initial stable state. Bi-stable Multivibrators** are one kind of multivibrators whose operation depends upon the external triggers pulse so as to switch between their two acceptable stable states. It can remain in either of these **two absolutely stable states** unless an **external trigger pulse** switches it from **one stable state** to the **other another stable state.**

⇨ **Also point is noted that,** it can **stay in one of its two stable states indefinitely as long as power is supplied.** Obviously, **it does not oscillate between two stable states because it has no energy storage element.** When **BMV** receive an external trigger pulse in such way that then it switch the **BMV** from **First Initial Stable State** to **another Second Stable State**. If left to itself, the **Bi-stable Multivibrator** will stay in this position forever. Then the circuit will **stay in the new position.** When it receives **another input triggering pulse**, only then it switch the **BMV** back from **Second Stable State** to its **First Initial Stable State** (**original state).** These circuits are **also called as Trigger Circuits. It is also known** as a **Flip-Flop Multivibrator** because of it switches back and fourth between the two possible **absolutely stable states,** it can assume.

⇨ A **Bi-stable Multivibrator (BMV)** circuit diagram **shown above in Figure (1),** is an **electronic circuit also referred to as a Flip-Flop or Latch.** It is a circuit that has **two stable states** and can be used to **store one bit Binary information**. Since **one trigger pulse** causes the **BMV** to **'FLIP'** from **one stable state to another stable state** and the **next pulse causes** it to **'FLOP'** back to its **original stable state.** By above this reason **BMV** is also **popularly known as 'FLIP-FLOP' Circuit**.

⇨ **Flip-Flops and Latches** are a **fundamental building block of digital electronics systems. One of their chief applications** is in **storing 1-bit data** and as such they are widely used in computers and processor systems.

⇨ **BMV** has an output which can be in one of two states, **logic 0 or logic 1.** Output will stable in these two states: **Output LOW and Output HIGH or logic 0 and logic 1.** The key thing is that it is stable in either state, i.e. unless we do something to its inputs its output will stay the same. The inputs may be **"SET"** and **"RESET".** An inputs pulse changes the output of **BMV** from **logic 0 to logic 1** and another input pulse causes it back to **logic 1 to logic 0.** This is **also called an S-R Flip-Flop.** When **S-R Flip Flop** receives input pulse it changes states from **0 to 1 and back it1 to 0.**

⇨ Detailed **of the Transistor Bi-Stable Multivibrator Circuit Diagram** is discussed in next **Lecture – 16.**

to be continued .....

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