

# Multivibrators

## 3.1 Introduction

The different types of sinusoidal as well as nonsinusoidal waveforms are used in variety of electronic applications. The nonsinusoidal waveforms include the waveforms such as square wave, rectangular wave, triangular wave, sawtooth, ramp etc. There are certain electronic circuits which are in use to generate such nonsinusoidal waveforms.

**Key Point :** *The electronic circuits which are used to generate nonsinusoidal waveforms are called multivibrators.*

The multivibrator is nothing but a two stage amplifier, operating in two modes. The modes are called **states** of the multivibrator. The output of the first stage is fed to the input of the second stage while the output of the second stage is fed back to the input of the first stage. These input signals drive the active device of one stage to saturation while the other to cut-off. The new set of signals, generating exactly opposite effects, then follows. Thus the cut-off stage now saturates while the saturated stage becomes cut-off.

**Key Point :** *The overall operation of the multivibrator is based on the fact that no two active devices have exactly identical characteristics.*

This chapter provides the detail analysis of different types of multivibrator circuits.

## 3.2 Types of Multivibrators

There are three types of multivibrator circuits in use, namely,

- a) Bistable multivibrator
- b) Monostable multivibrator
- c) Astable multivibrator

Let us see the basic concept behind the operation of these three types of multivibrators.

### 3.2.1 Bistable Multivibrator

As the name suggests, the bistable multivibrator has two stable states. The multivibrator can exist indefinitely in either of the two stable states. It requires an external trigger pulse to change from one stable state to another. The circuit remains in one stable state unless an external trigger pulse is applied.

**Key Point :** *The bistable multivibrator is also known by variety of other names as Eccles-Jordan circuit, trigger circuit, scale-of-2 toggle circuit, flip-flop and binary.*

The bistable multivibrator is used for the performance of many digital operations such as counting and storing of the binary information. This multivibrator circuit also finds an application in the generation and processing of pulse-type waveforms.

### 3.2.2 Monostable Multivibrator

The monostable multivibrator has only one stable state. The other state is unstable referred as quasi-stable state. When an external trigger pulse is applied to the circuit, the circuit goes into the quasi-stable state from its normal stable state. After sometime interval, the circuit automatically returns to its stable state. The circuit does not require any external pulse to change from quasi-stable to stable state. The time interval for which the circuit remains in the quasi-stable state is determined by the circuit components and can be designed as per the requirement.

**Key Point :** *The monostable multivibrator is also known by variety of other names such as one-shot, single-shot, a single cycle, a single swing, a single step multivibrator or a univibrator. It is also called gating circuit or delay circuit.*

The circuit is used to generate the rectangular waveform and hence can be used to gate other circuits hence called gating circuit. The time between the transition from quasi-stable state to stable state can be predetermined and hence it can be used to introduce time delays with the help of fast transition. Due to this application, it is also called delay circuit.

### 3.2.3 Astable Multivibrator

The astable multivibrator has both the states as quasi-stable states. None of the states is stable state. Due to this, the multivibrator automatically makes the successive transitions from one quasi-stable state to other, without any external triggering pulse. The rate of transition from one quasi-stable state to other is determined by the circuit components.

**Key Point :** *As this multivibrator does not require any external pulse for the transition, is called free running multivibrator.*

The astable multivibrator is nothing but an oscillator. It is used as the generator of square waves. As it requires no triggering it is used as a basic source of fast waveforms.

Both monostable and astable multivibrators find extensive application in pulse circuitry.