Week No - 7

- The use of op-amp as astable multivibrator.
- The use of op-amp as monostable and Bistable multivibrator.
- Classification of Oscillators.

Multivibrator

A multivibrator is an electronic circuit used to implement a variety of simple two-state systems such as oscillators, timers and flip-flops. It is characterized by two amplifying devices (transistors, electron tubes or other devices) cross-coupled by resistors and capacitors. There is three types of multivibrator circuit:

- **astable**, in which the circuit is not stable in either state—it continuously oscillates from one state to the other. Due to this, it does not require an input (Clock pulse or other).

- **monostable**,

  in which one of the states is stable, but the other is not—the circuit will flip into the unstable state for a determined period, but will eventually return to the stable state. Such a circuit is useful for creating a timing period of fixed duration in response to some external event. This circuit is also known as a **one shot**. A common application is in eliminating switch bounce.

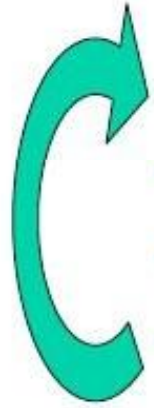
- **bistable**, in which the circuit will remain in either state indefinitely. The circuit can be flipped from one state to the other by an external event or trigger. Such a circuit is important as the fundamental building block of a Register or memory device. This circuit is also known as a latch or a flip-flop.

Astable Multivibrator

Output: $U_o = -V_s, +V_s$

$u_+ = \pm V_s R_2/(R_1+R_2)$

Start: $U_0=+V_s$, C empty ($u_- = 0V$)

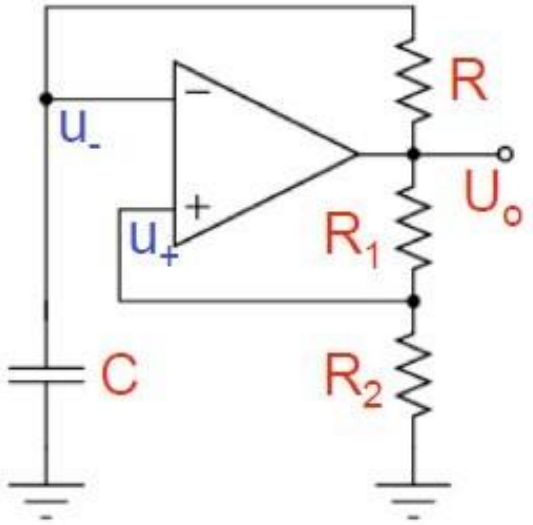


→ C charged through R ⇒ u_- ↗

→ u_- passes u_+ ⇒ U_o reverts to $-V_s$

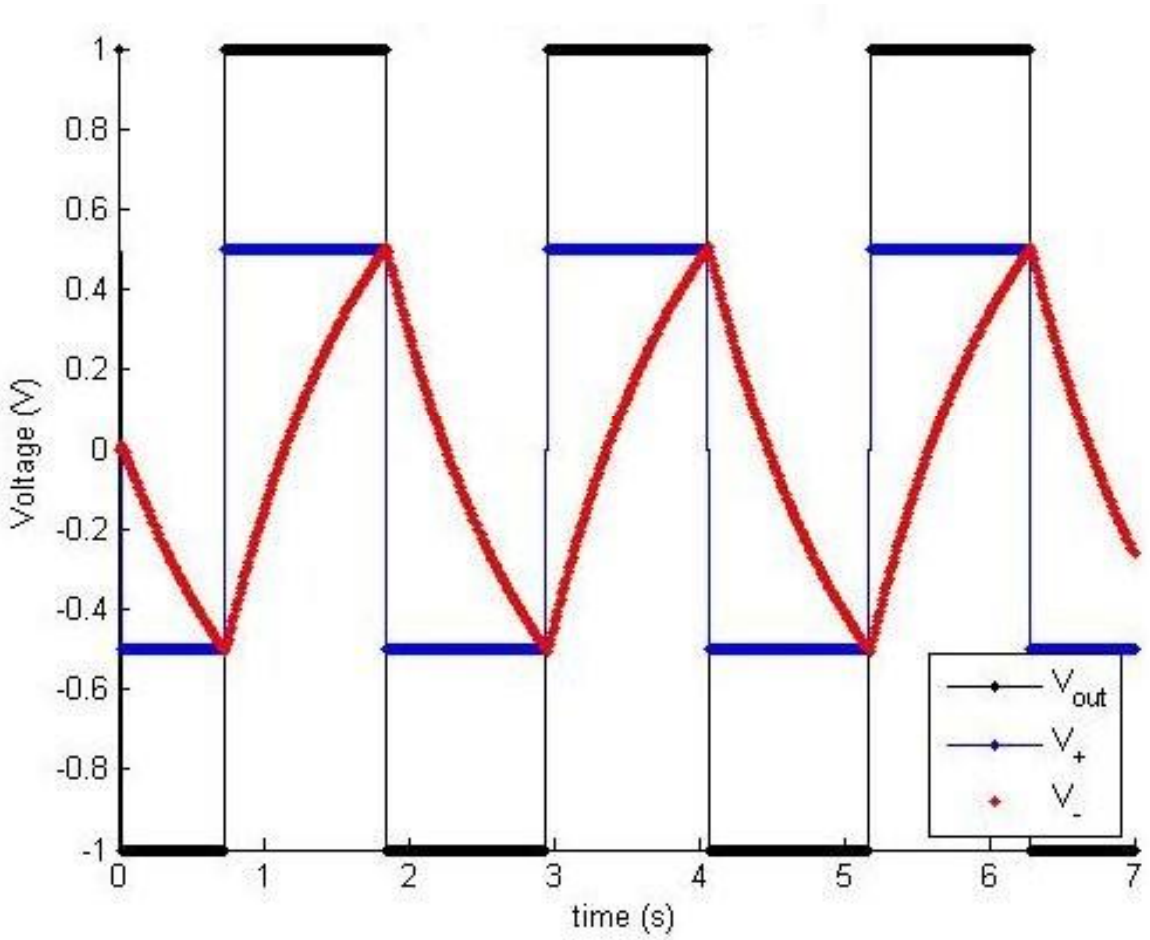
→ C discharged through R ⇒ u_- ↘

→ u_- passes u_+ ⇒ U_o reverts to $+V_s$

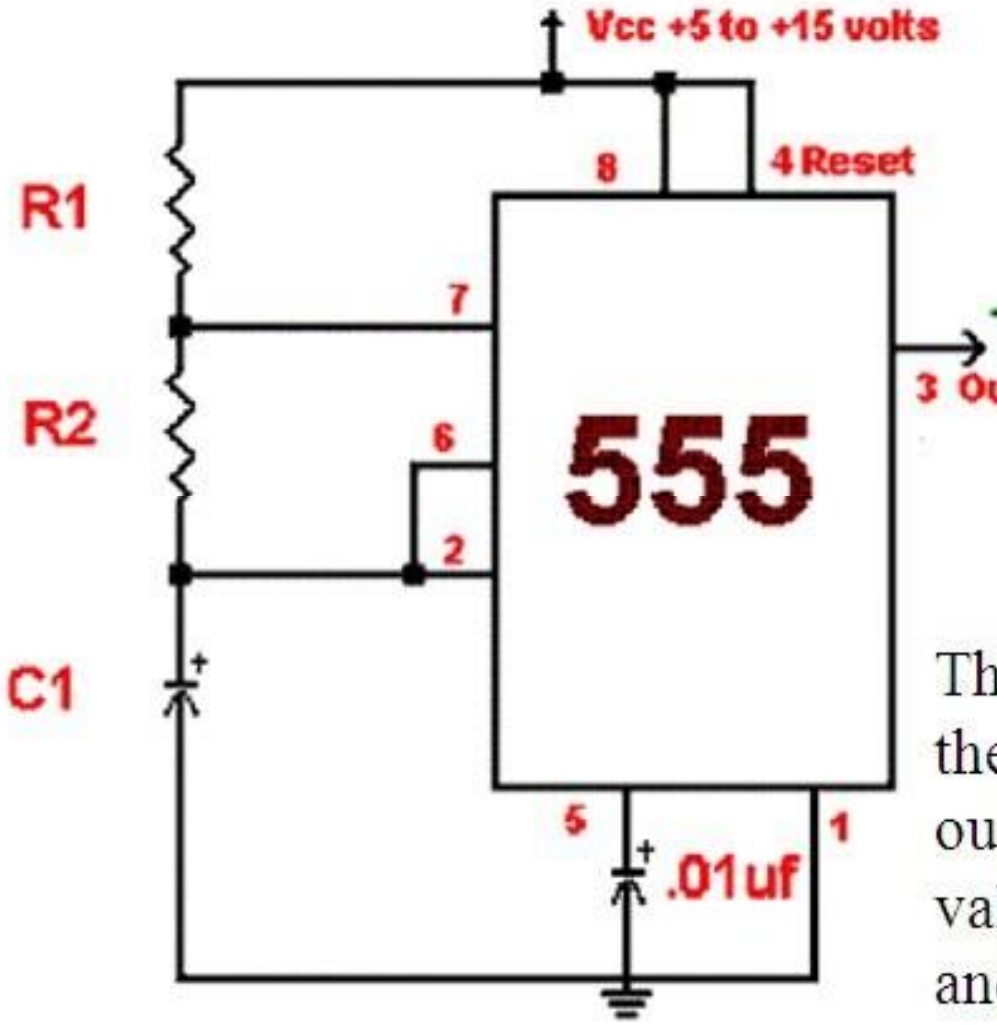


Period: $T = 2RC\ ln(1+2R_2/R_1)$

Waves forms



Astable Multivibrator

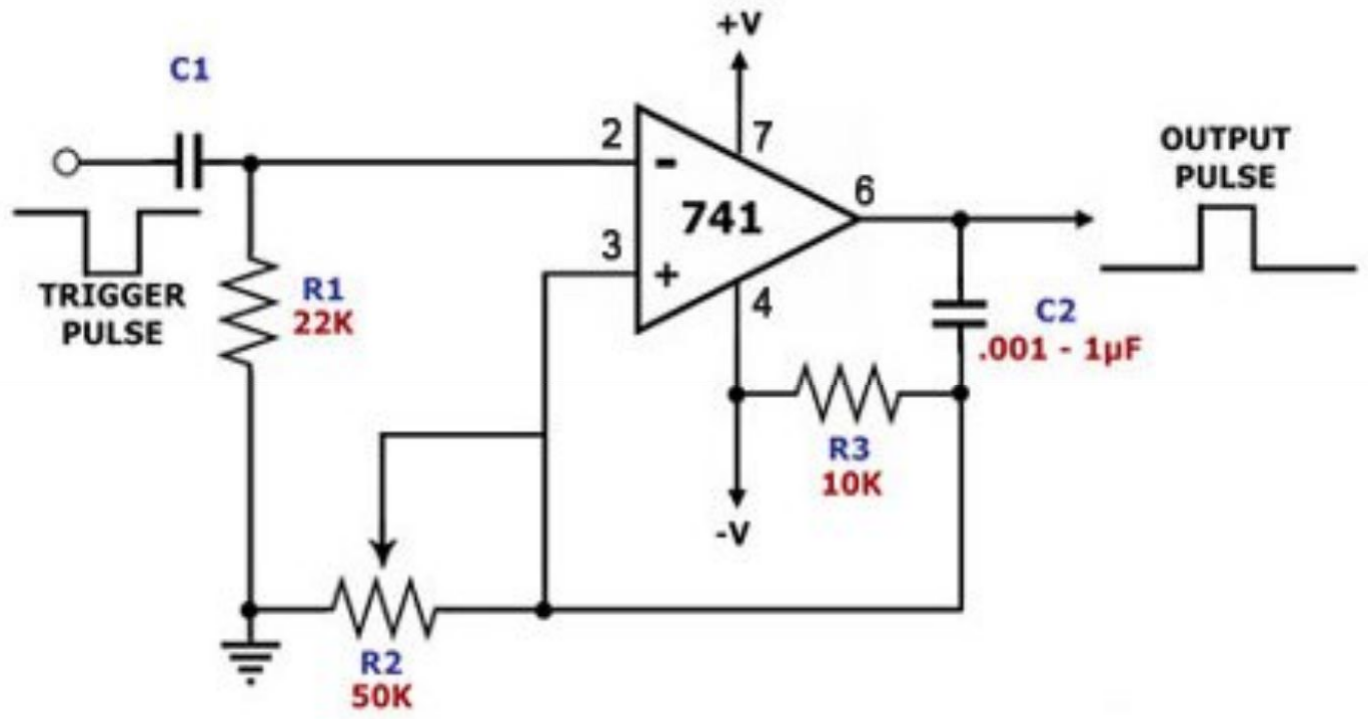


$$T_{on} = 0.693(R1 + R2)C1$$

$$T_{off} = 0.693(R2)C1$$

These equations determine the characteristics of your output pulses based on the values you choose for R1, R2 and C1.

Op-Amp Monostable Multivibrator



Op-Amp Monostable Multivibrator Circuit Diagram

Classification of Oscillators

- Electronic oscillators may be broadly divided into following two groups:

i) sinusoidal (or harmonic) oscillators-which produce an output having sine wave form

ii) non- sinusoidal (or relaxation) oscillators- they produce an output which has square, rectangular or sawtooth wave form, employ circuit building blocks known as multivibrators.

USES of multivibrators

- As saw tooth generator
- As square wave and pulse generator
- As standers frequency source
- For many specialized uses in radar and

TV circuits

- As memory element in computers

Bistable Multivibrator (BMV)

- It is also called fip-flop multivibrators. It has two absolutely stable states. It can remain in either of these two states unless an external trigger pulse switches it from one state to other. Obviously, it does not oscillate.