Experiment :

Date 24/9/24

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Experiment-6

Astable and Monostable Multivibrator using IC 555

Aim- To study astable and monostable multivibrator using IC 555

Theory- Multivibrator is electronic ckt used to implement 2 state systems like flip flops, timers, classified into-3 types - ① Monostable
② Astable
③ Bistable

A bistable multivibrator ckt is stable that can be changed from one state to another by external trigger pulse
Also called flip-flop

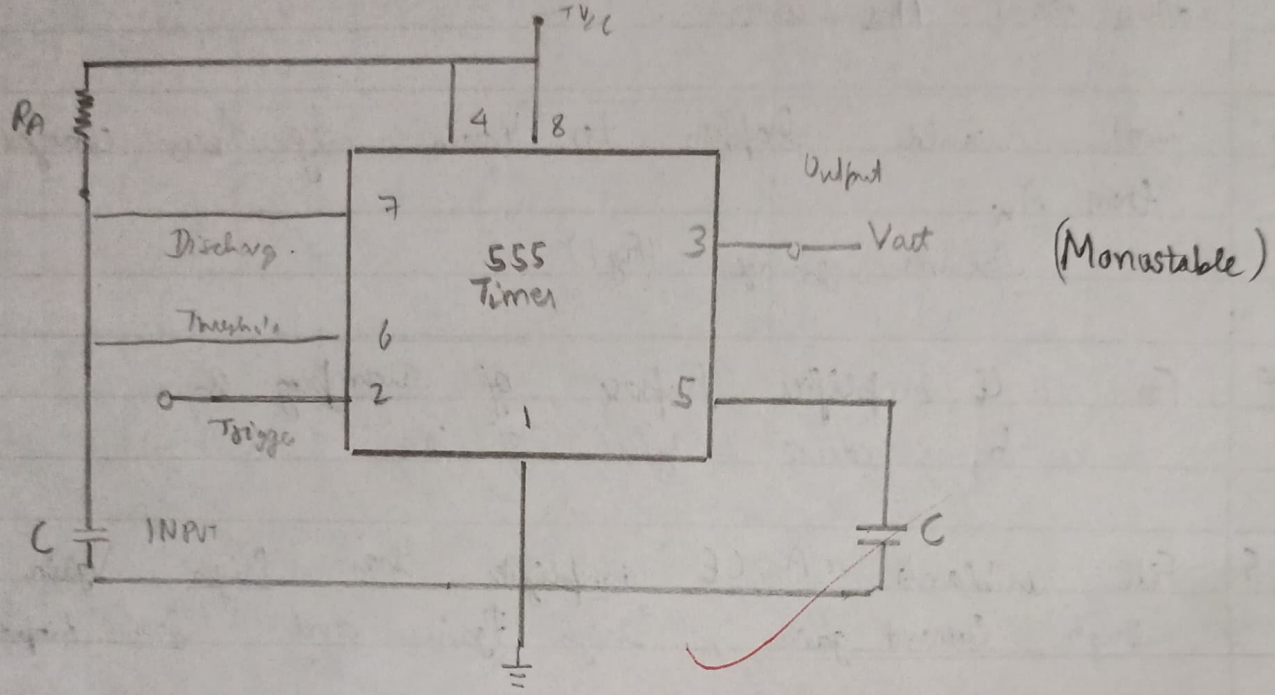
① Monostable multivibrator
They have only one stable state that is used to generate singe o/p pulse of specified width value when external trigger applied. It will continue in this state till another i/p is required. produces much longer rectangular waveform.

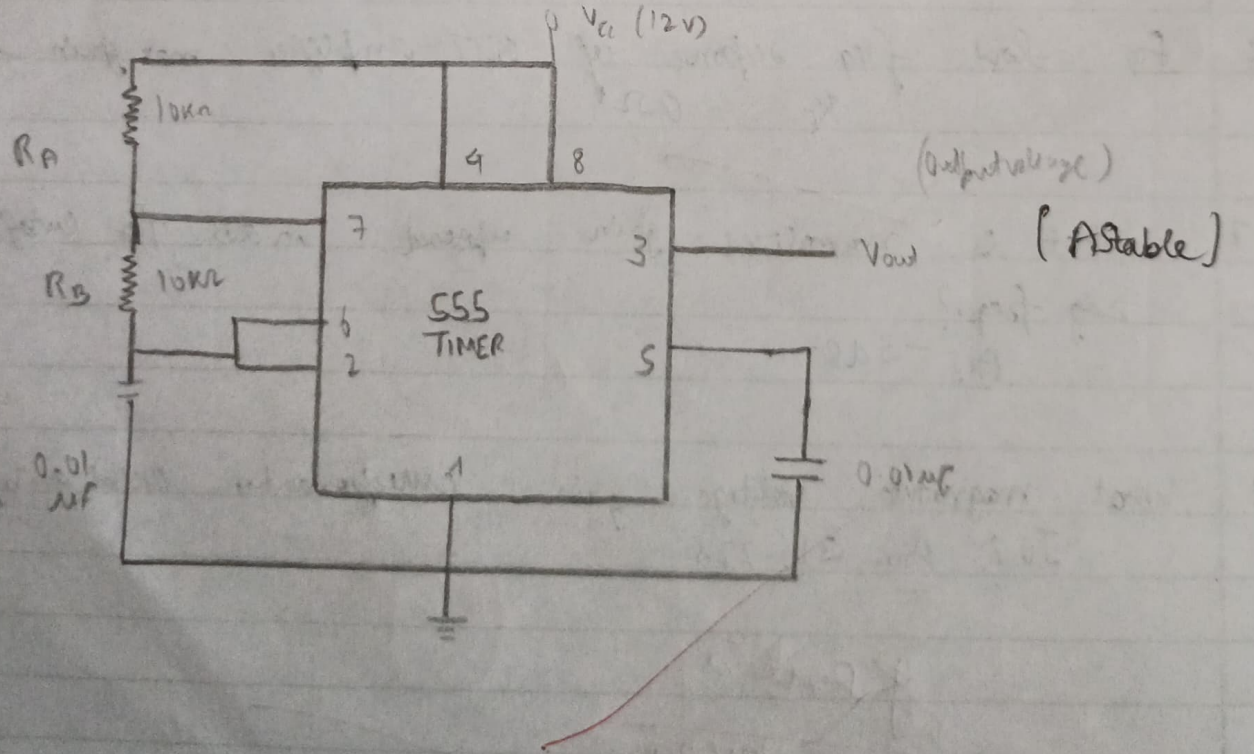
Time duration (T) = RC x 1.1

It only needs one single pulse to start and constructed easily, less price Used in storage ckt.

CLASSTIME

⇨ Diagram


+V_CC
RA
4
8
7
Discharg.
555
Timer
3
Output
Vout
(Monostable)
Threshold
6
2
Trigge
1
5
C
INPUT
C


V_CC (12V)
10KΩ
RA
4
8
(Output voltage)
7
3
Vout
(AStable)
RB
10KΩ
555
TIMER
6
2
5
0.01
μF
1
0.01μF

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② Astable Multivibrator

Also known as free running / alternatives between output voltage levels, It is a multivibrator in which circuit isn't stable in either state, It continually switches from one state to another.

$$T = 0.693 * (R_1 + 2R_2) C_1$$

$$f = 1/T$$

Duty cycle (ratio of time for which output is high to total time) :-

$$\frac{T_1}{T} \times 100 = \frac{R_1 + R_2}{R_1 + 2R_2} \times 100$$

↳ Apparatus - 555 timer IC, Connecting wires, oscilloscope, resistor, Capacitor, breadboard.

↳ Precautions :-

1. Ensure supply voltage doesn't exceed in 555
2. Ensure capacitor discharges properly
3. Ensure IC doesn't overheat

↳ Conclusion - Behaviour of both multivibrators were demonstrated Astable generated a continuous square wave while monostable produced single pulse in response to trigger

CLASSTIME

* Observation Table

① Monostable (V_{cc} = 12V, R_A = 10KΩ, C = 0.01μF)

S.No	R(KΩ)	Capacitance (μF)	Pulse width (msec)	Duty Cycle (D%)
1	70	0.01	1.1	11
2	30	0.01	3.3	33
3	50	0.1	5.5	55
4	70	0.1	7.7	77

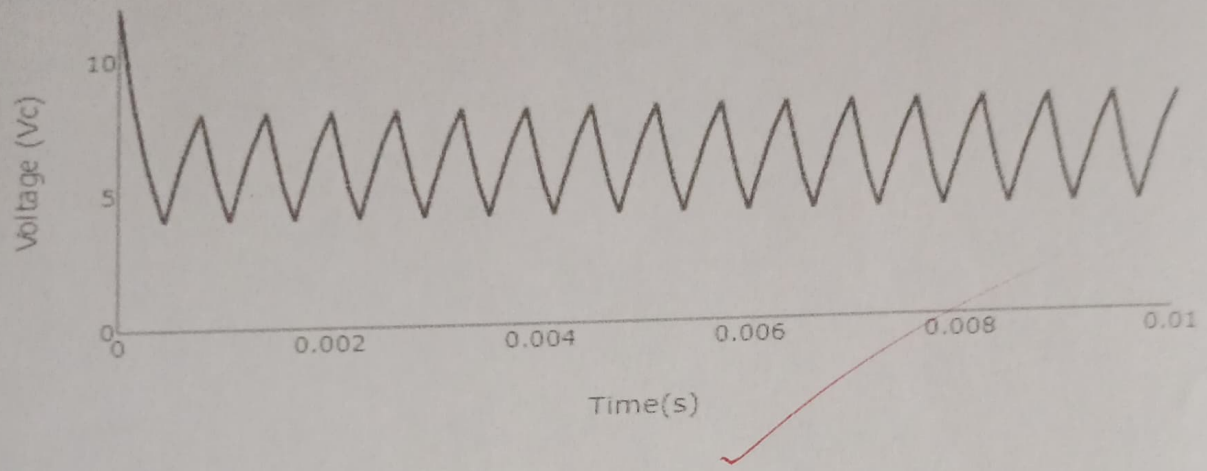
[Least Count = 1 milisecond]

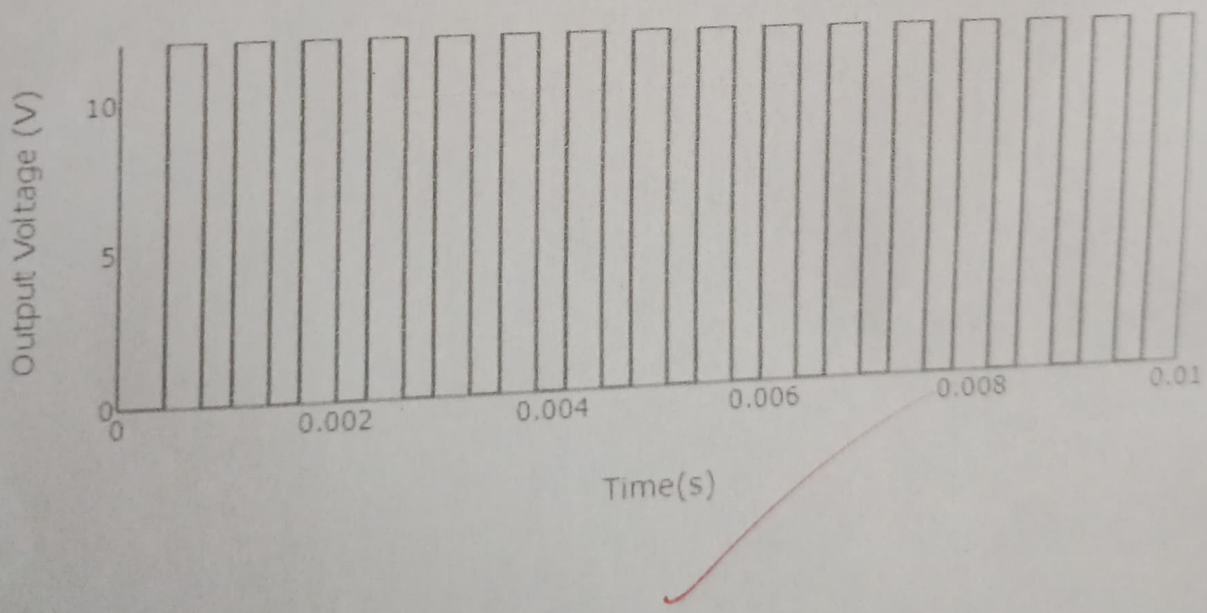
② Astable (V_{cc} = 12V, $R_H = R_B$ = 10KΩ, C = 0.01μF)

S.No	R_A (KΩ)	R_B (KΩ)	C (μF)	Pulse width (Tp msec)	T (msec	D%	Freq (Hz)
1	1	3.9	0.1	0.338	0.607	55.68	1.65
2	3	3.9	0.1	0.476	0.795	63.89	1.34
3	5	3.9	0.1	0.614	0.683	69.53	1.13
4	7	3.9	0.1	0.752	1.026	73.65	0.88
5	9	3.9	0.1	0.890	1.159	76.99	0.66

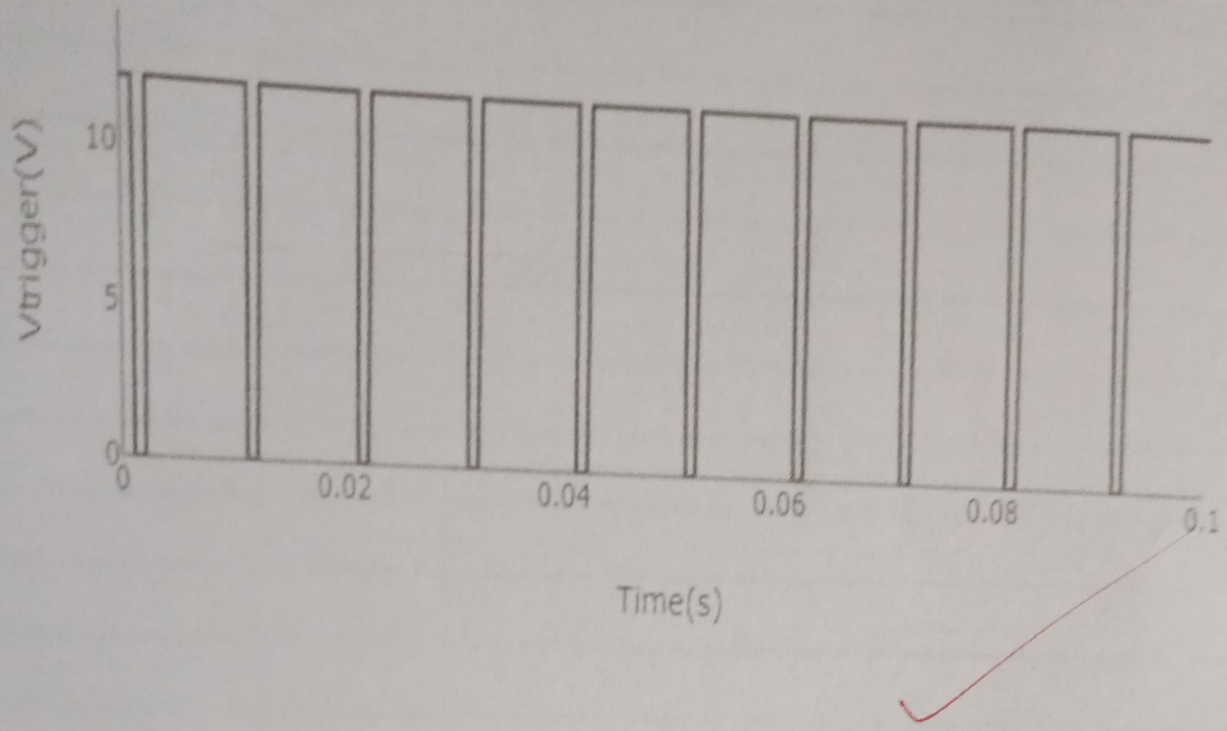
[Least Count = 1 milisecond]

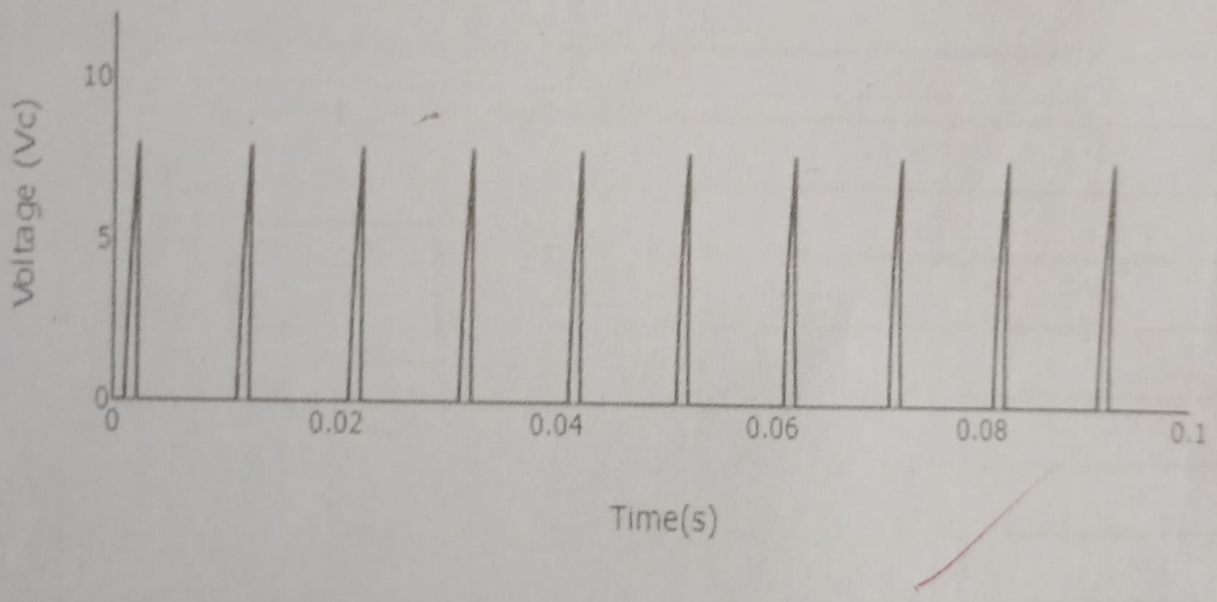
ASTABLE

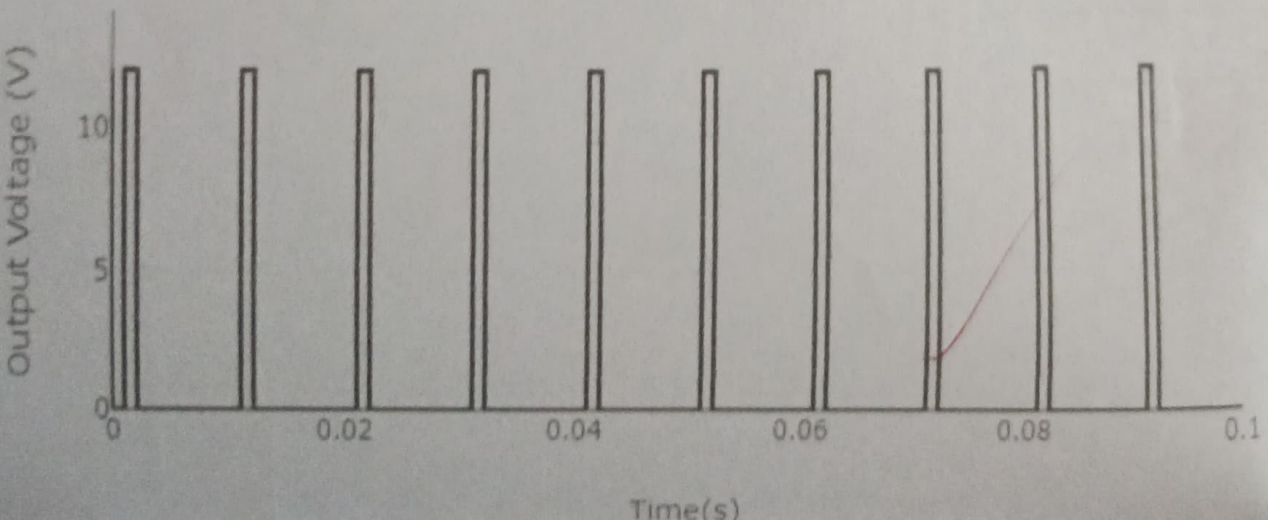

Voltage (Vc)
10
5
0
0
0.002
0.004
0.006
0.008
0.01
Time(s)


Output Voltage (V)
10
5
0
0
0.002
0.004
0.006
0.008
0.01
Time(s)

MONOSTABLE


Vtrigger(V)
10
5
0
0
0.02
0.04
0.06
0.08
0.1
Time(s)


Voltage (Vc)
10
5
0
0
0.02
0.04
0.06
0.08
0.1
Time(s)


Output Voltage (V)
10
5
0
0
0.02
0.04
0.06
0.08
0.1
Time(s)