



6/23/2022

EXPERIMENT NO.10

EC111

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ROLL NO. 2101227

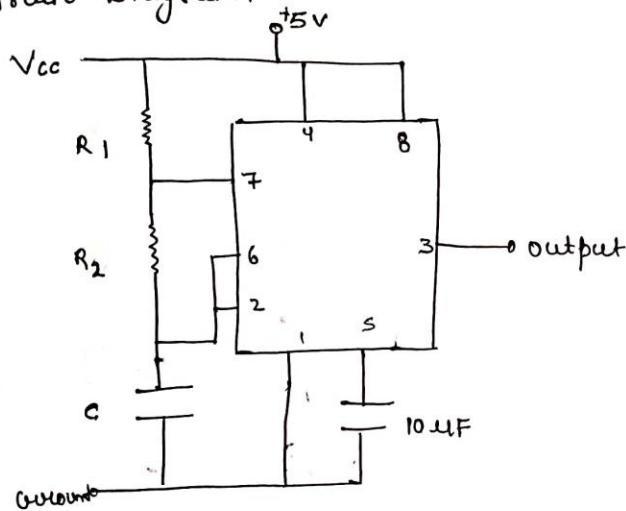
GROUP NO.18

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Experiment No. 10

Aim: To design a stable multivibrator using 555 timer IC

Circuit Diagram:



$$R_1 = 100 \text{ k}\Omega$$

$$R_2 = 22 \text{ k}\Omega$$

$$C = 10 \mu\text{F}$$

$$f_{\text{freq.}} = 820 \text{ Hz}$$

$$\text{Duty cycle} = 84.8 \%$$

Calculation:

$$f_o = \frac{1.44}{(R_1 + R_2)C} = 1180 = 1.18 \times 10^3$$

$$\text{Duty Cycle } \% = \frac{R_1 + R_2}{R_1 + 2R_2} \times 100 \% = 84.79 \%$$

$$\text{High Time } (T_H) = 0.69 \times (R_1 + R_2) \times C = 8.418 \times 10^{-4}$$

$$\text{Low Time } (T_L) = 0.69 \times R_2 \times C = 1.518 \times 10^{-4}$$

$$\text{Time period } (T) = T_H + T_L = 9.936 \times 10^{-4}$$

Verified
23/06/2022

EXPERIMENT NO. 10

TITLE: DESIGN OF ASTABLE MULTIVIBRATOR.

OBJECTIVE:

- To design a multivibrator (astable) using 555 timers, so that frequency $f_0=50\text{kHz}$ and duty cycle (%) =85%.

APPARATUS REQUIRED:

- Breadboard
- Connecting wires
- Resister
- Power supply
- IC 555
- Function generator
- oscilloscope

THOREY:

In the 555 Oscillator above, pin 2 and pin 6 are connected allowing the circuit to retrigger itself on every cycle allowing it to operate as a free-running oscillator. During each cycle capacitor, C charges up through both timing resistors, R1 and R2 but discharges itself only through a resistor, R2 as the other side of R2 is connected to the discharge terminal, pin 7. Then the capacitor charges up to $\frac{2}{3}V_{cc}$ (the upper comparator limit) which is determined by the $0.693(R1+R2) C$ combination and discharges itself down to $\frac{1}{3}V_{cc}$ (the lower comparator limit) determined by the $0.693(R2 .C)$ combination. This results in an output waveform whose voltage level is approximately equal to $V_{cc} - 1.5V$ and whose output "ON" and "OFF" periods are determined by the capacitor and resistors combinations.

FORMULA USED:

$$F_0 = 1.44 / ((R1+R2) * C)$$

$$\text{Duty cycle in \%} = ((R1+R2) / (R1+2*R2)) * 100$$

$$\text{High time (TH)} = 0.69 * (R1 + R2) * C$$

$$\text{Low time (TL)} = 0.69 * R2 * C$$

$$\text{Time period (T)} = TH + TL = 0.69 * (R2 + 2 * R2) * C$$

CIRCUIT DIAGRAM:

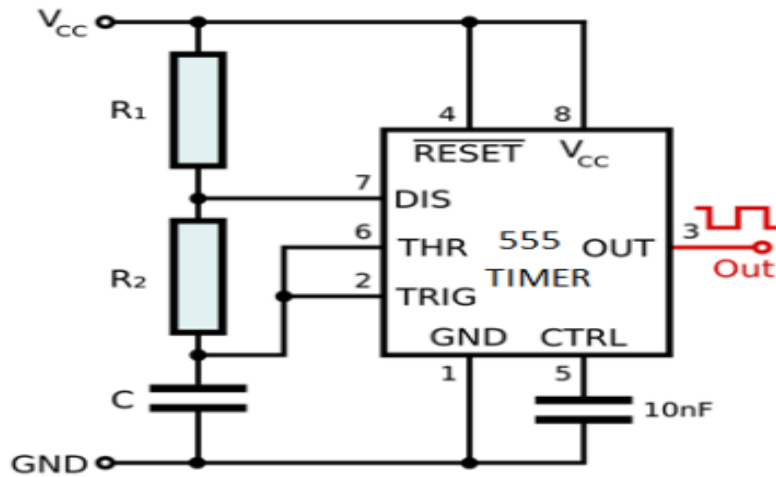
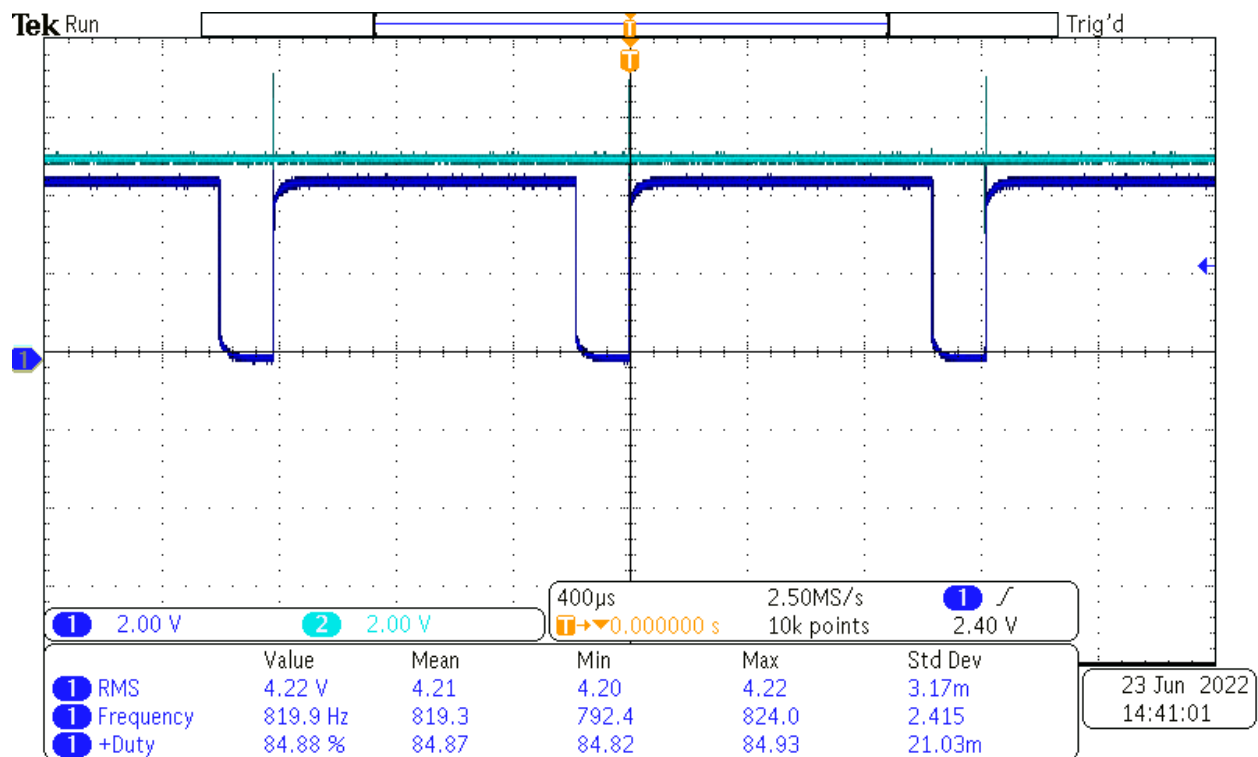


Fig 10.1: Circuit diagram of Astable Multivibrator

OBSERVATION:



CALCULATIONS:

$$F_0 = 1.44 / ((R_1 + R_2) * C) = 1180 \text{ Hz}$$

$$\text{Duty cycle in \%} = ((R_1 + R_2) / (R_1 + 2 * R_2)) * 100 = 84.72 \%$$

$$\text{High time (TH)} = 0.69 * (R_1 + R_2) * C = 8.418 * 10^{-4}$$

$$\text{Low time (TL)} = 0.69 * R_2 * C = 1.518 * 10^{-4} \text{ sec}$$

$$\text{Time period (T)} = T_H + T_L = 0.69 * (R_2 + 2 * R_2) * C = 9.936 * 10^{-4} \text{ sec}$$

RESULT:

- Successfully construct astable multivibrator using IC-555.

PRECAUTIONS:

- While experimenting does not exceed the ratings of IC. This may lead to damage to the IC.
- Connections should be made accordingly to the circuit diagram only.
- Do not be on the DC power supply for a long time otherwise diode may be burned.
- Wires should be tight and no short-circuiting should be there.
- Do not cross the maximum power rating.