EXPERIMENT NO.10

TITLE: IC555 AS ASTABLE MULTIVIBRATOR.

OBJECTIVES:

1. To assemble the circuit of **ASTABLE MULTIVIBRATOR** using IC555.
2. To observe and plot the output voltage waveform (output voltage & voltage across capacitor) of **ASTABLE MULTIVIBRATOR**.

LAB REQUIREMENTS:

Breadboard, IC555, Resistor (R1 & R2), Capacitor (C1),DC regulated Dual power supply (0-30V),CRO/DSO and connecting wires/Probes.

CIRCUIT DIAGRAM:

THEORY:

An astable multivibrator is often called as a free running multivibrator i.e. reactangular wave generating circuit. As that of monostable multivibrator, it does not requires an external trigger to change the state of output hence it is called as free running. However, the time during which output is either high or low is determined by two external resistors and a capacitor externally connected to the 555 timer.

As shown in the circuit diagram, initially when output is high, capacitor C start charging towards Vcc through R1 & R2. However as soon as voltage across capacitor equals to $\frac{2}{3}V_{cc}$, threshold comparator triggers the F/F and output switches to low. Now Capacitor starts discharging through R2 and internal transistor. When Voltage across C

become less than or equal to $\frac{1}{3}V_{cc}$, trigger comparator output changes the state of F/F and output goes high. This Cycle repeats again and rectangular waveform is observed at the output of timer.

The time during which the capacitor charges from $\frac{1}{3}V_{cc}\ to\ \frac{2}{3}V_{cc}$ is equal to the time the output is high and is given by-

$$t_c = 0.69(R_1 + R_2)\text{C}$$

Similarly, the time during which the capacitor discharges from $\frac{2}{3}V_{cc}\ to\ \frac{1}{3}V_{cc}$ is equal to the time the output is low and is given by-

$$t_d = 0.69(R_2)\text{C}$$

The total period of output waveform is given by-

$$T = t_c + t_d = 0.69(R_1 + 2R_2)\text{C}$$

Hence the output frequency of oscillation is given by-

$$f_o = \frac{1}{T} = \frac{1.45}{(R_1 + 2R_2)\text{C}}$$

Duty cycle is the ratio of on time to total time of the waveform and is given as-

$$D = \frac{t_c}{T} = \frac{0.69(R_1 + R_2)\text{C}}{0.69(R_1 + 2R_2)\text{C}} = \frac{(R_1 + R_2)}{(R_1 + 2R_2)}$$

Duty cycle of the square wave is 50%.

EXPERIMENTAL PROCEDURE:

1. Refer the Pin Diagram of IC555 & assemble the Astable Multivibrator circuit as per circuit diagram on the breadboard.
2. Set the DC power supply to provide $+V_{CC}$=+5V & Apply V_{CC} at respective pin of IC555.
3. Connect output pin (3) of 555 to channel 1 of CRO/DSO and pin(6/2) to channel 2 of CRO/DSO with respect to ground.
4. Observe the output waveforms (i.e. output voltage and voltage across capacitor) on CRO/DSO.
5. Measure the output voltage, voltage across capacitor, $t_c, t_{d,}T, fo$.Note the readings in the observation table.
6. Calculate the theoretical values of above measured parameters.
7. Plot the output voltage waveforms for output voltage and voltage across capacitor.

OBSERVATION TABLE:

Sr No	R1 KΩ	R2 KΩ	C nF	Vo p-p	Vc p-p	Tc(ms)		Td(ms)		T(ms)		fo(Hz)	
						Theo.	Prac.	Theo.	Prac.	Theo.	Prac.	Theo.	Prac.

CALCULATIONS:

(Theoretical)

RESULT:

1. **Circuit of Astable Multivibrator using IC555 has been assembled.**
2. **It has been observed from the output waveform that output is _____wave with duty cycle of_____.**
3. **Output remains high upto the duration in which capacitor_____and becomes low when _____.**
4. **Output frequency of oscillation is found to be_____.**

EVALUATION (BY TEACHER):

Excellent/Good/Average/Poor