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LAB #1

ELCN8005-21F-Sec1-Electronics Design Principles

Astable Multivibrator

OBJECTIVE

1. Build an Astable Multivibrator using 2 BJTs, 2 LEDs, and capacitors.
2. Design and redraw your own circuit diagram by adding LEDs to blink.
3. Show your choice of values for Capacitors and Resistors based on calculation/reasons.
4. Show your results on oscilloscope CH1 (input) and CH2 (output)

EQUIPMENTS

Resistor – 2 x (47k,470,200, 20k, 1k, 50k, 300, 40k, 500, 70k)

Capacitor – 2 x 1uf, 5uf, 2uf, 1uf, 0.01uf

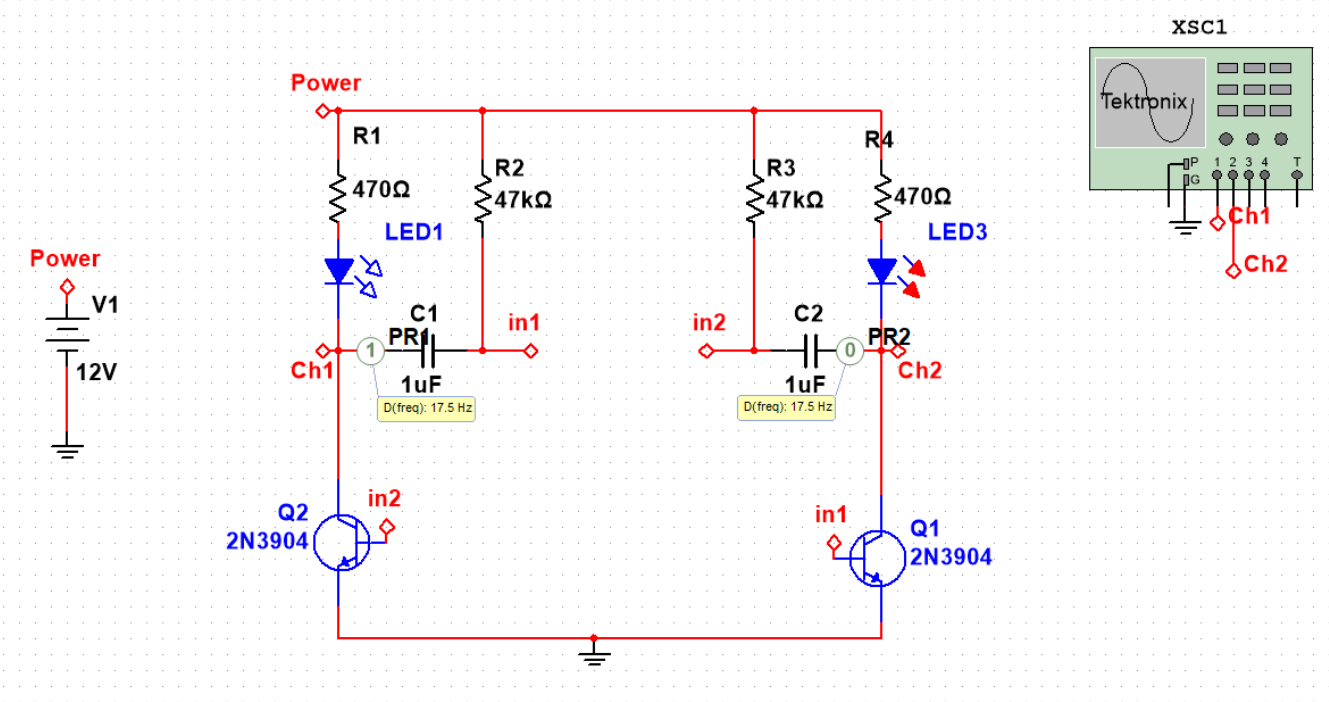
Transistor – 2 x 2N3904

LED - 2

Power supply – 12v DC

Multisim software.

SCHEMATIC IN MULTISIM



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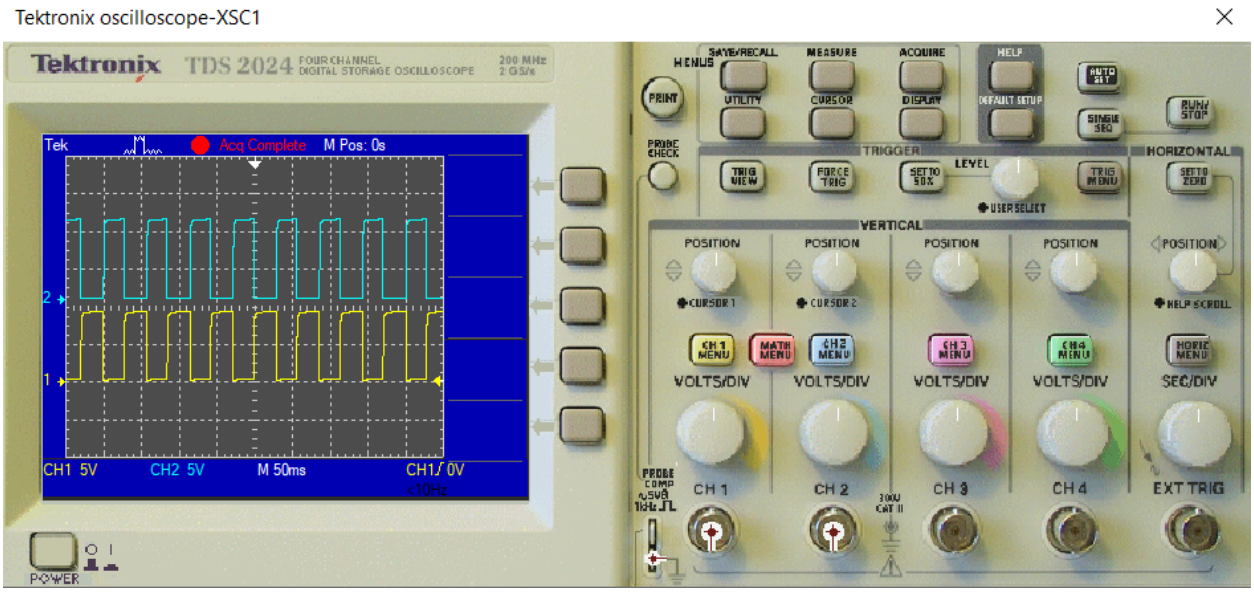
OUTPUT



INPUT

	R1	R2	R3	R4	C1	C2
Case 1	470	47k	47k	470	1uf	1uf
Case 2	200	20k	20k	200	5uf	5uf
Case 3	1k	50k	50k	1k	2uf	2uf
Case 4	300	40k	40k	300	1uf	1uf
Case 5	500	70k	70k	500	0.01uf	0.01uf

CALCULATIONS

T = t1 +t2

t1=0.693 x C1 x R2

t2=0.693 x C2 x R3

All time values are in seconds, all resistor values are in ohms, all capacitance values are in farads.

0.693 is derived from the RC time constant, or τ. At 0.693 of one time constant the capacitor is at 1/2 of its maximum charge.

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Finding the frequency (f) of oscillation is a simple case of finding the inverse of T.

$\boldsymbol{f}$ = 1/T

Case 1:

t1=0.693 x 0.000001 x 47000 = 0.032571

t2=0.693 x 0.000047 x 47000 = 0.032571

T = 0.032571 + 0.032571 = 0.065142

f = 1/0.065142 = 15.35107 Hz

Case 2:

t1=0.693 x 0.000005 x 20000 = 0.0693

t2=0.693 x 0.000005 x 20000 = 0.0693

T = 0.0693+ 0.0693 = 0.1386

f = 1/ 0.1386 = 7.2150 Hz

Case 3:

t1=0.693 x 0.000002 x 50000 = 0.0693

t2=0.693 x 0.000002 x 50000 = 0.0693

T = 0.0693+ 0.0693 = 0.1386

f = 1/0.1386 = 7.215 Hz

Case 4:

t1 = 0.693 x 0.000001 x 40000 = 0.02772

t2 = 0.693 x 0.000001 x 40000 = 0.02772

T = 0.02772 + 0.02772 = 0.05544

f = 1/0.05544 = 18.03751 Hz

Case 5:

t1 = 0.693 x 0.00000001 x 70000 = 0.0004851

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t2 = 0.693 x 0.00000001 x 70000 = 0.0004851

T = 0.0004851 + 0.0004851 = 0.0009702

f = 1/0.0009702 = 1.03 kHz

THEORY VS PRACTICAL

	Theory	**Practical**
Case 1	15.351 Hz	17.5hz
Case 2	7.2150 Hz	8.28hz
Case 3	7.215 Hz	8.18hz
Case 4	18.03751 Hz	20.7hz
Case 5	1.03 kHz	1.18khz

CONCLUSION

- The difference in the theory and practical is due to the passive components used in circuit such as resistor and capacitor. Its due to the manufacture and raw material used in these components.
- The tolerance of theory and practical is around (+- 2).

DISCUSSION

Astable multivibrator circuit is a non-stable circuit which continuously changes from one state to another state. In this circuit we used led to indicate the switching. In this circuit we used 4 resistor, 2 capacitors, 2 transistors and 2 leds. When the current is applied to the circuit the transistor opens when it receives 0.7v to its base from the capacitor. Capacitor charges and discharges with current. This state doesn't remain constant. Its keeps switching the state leads to astable multivibrator.