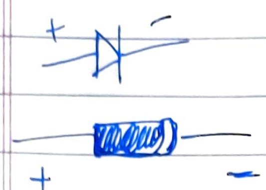
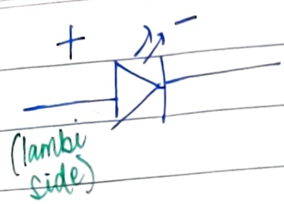
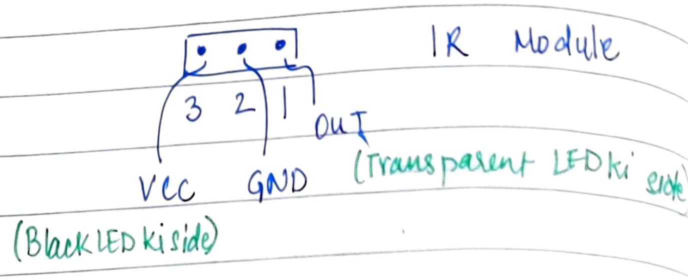
ECE Lab Exam



Diode



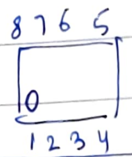
LED



IR Module

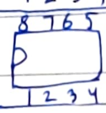
The one closer to tab is emitter

Case I :



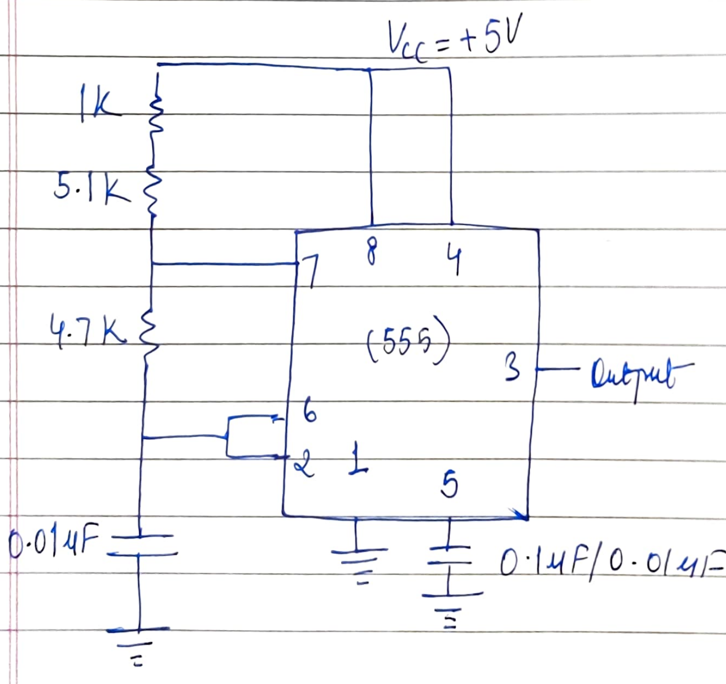
IC

Case II :



IC

1. (DSO)



Given: Duty cycle = 0.7

$$0.7 = \frac{R_1 + R_2}{R_1 + 2R_2}$$

$$0.7R_1 + 1.4R_2 = R_1 + R_2$$

$$0.4R_2 = 0.3R_1$$

$$\frac{R_1}{R_2} = \frac{4}{3} \approx 1.33$$

$\therefore R_1 = 5.1 k\Omega + 1 k\Omega = 6.1 k\Omega$

$R_2 = 4.7 k\Omega$

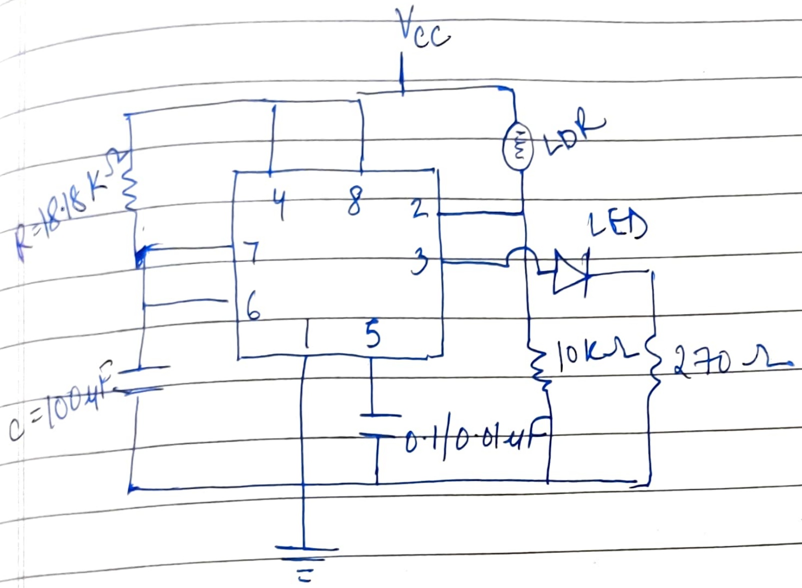
$\frac{R_1}{R_2} = 1.29 \simeq 1.3$

$$\begin{array}{r} 6.1 \\ 4.4 \\ \hline 15.5 \end{array}$$

$T = 0.693 \times (R_1 + 2R_2) \times C$

$= 0.693 \times 15.5 \times 0.01 \times 10^3 \times 10^{-6}$

$f = 1/T$



$2 = 1.1 RC$

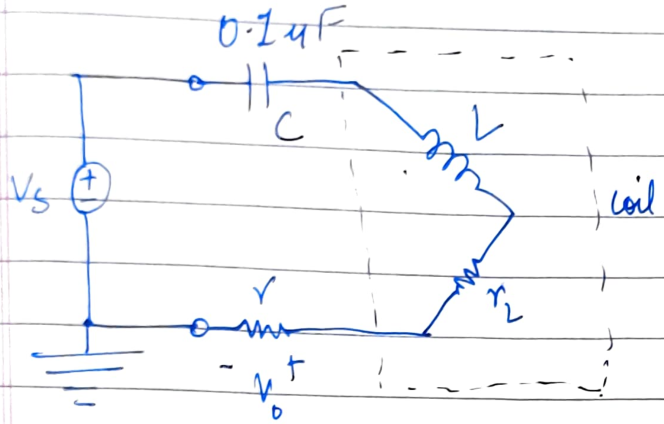
$R = \frac{2}{1.1 \times 100 \times 10^{-3}}$

$= \frac{2}{1.1 \times 10^{-1}} = \frac{2}{0.11} = 18.18 k\Omega$

The formula for ON-Time (T) when 555 Timer IC is used in monostable mode is given by:-

Formula: $\boxed{T = \cancel{1.1}\ln 3\, R_{eff} C}$ where, R_{eff} = Eff. Resistance in Circuit
C = Capacitance Value

3. Series Resonant RLC Circuit



Theory

Resonance is a property that enables one to select a particular freq. out of a signal containing many frequencies.

$$f_s = \frac{1}{2\pi\sqrt{LC}}$$

$$\frac{V_0}{V_S} = \frac{r}{r+r_2} = \text{slope} = \frac{\Delta Y}{\Delta X} = (\text{from DSO})$$

$$= A_m$$

(find r_2)

$$\frac{A_m}{\sqrt{2}} = x = \frac{CH_2}{CH_1}$$

$CH_2 = x \times 500$

$V_{out} = x \times 500$

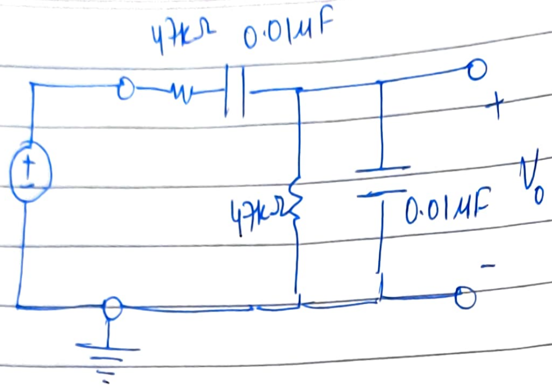
(Scale factor)

Applying V_{in} as 500 mV and Vout as 500 x.

Experimental r_2 | Measured from multimeter r_2

(DSO)

4.



Theoretical Calculations:-

(1) Center frequency (f_0)

$$f_0 = \frac{1}{2\pi RC}$$

$$f_{0\,(\text{theor.})} = \frac{1}{2\pi \times 47 \times 10^3 \times 10^{-8}} = \frac{10^5}{2\pi \times 47} = 338.8\text{ Hz}$$

(2) $B.W_{(\text{theor.})}$ is same as f_0 for this configuration

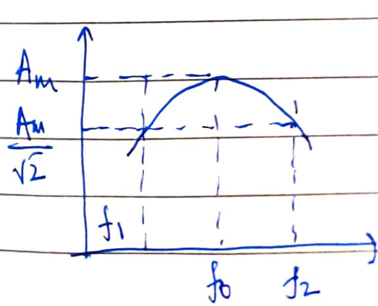
(3) Gain at center frequency:-

$$A_m = \frac{1}{3}$$

Observations & Calculations

$A_m = \frac{\Delta Y}{\Delta X}$ (Gain (calculate A_m))

$$\frac{V_0}{V_s} = \frac{A_m}{\sqrt{2}}$$ (calculate $V_{0(\text{prac})}$)



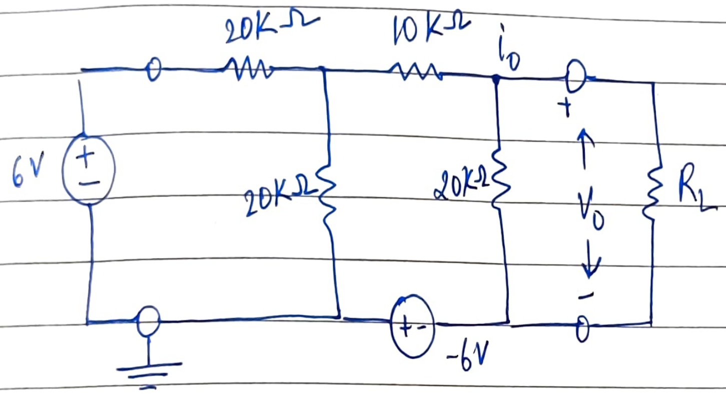
$$V_o \text{ (theor.)} = \frac{\frac{1}{3} \times V_s}{\frac{1}{\sqrt{2}}} = \frac{V_s}{3\sqrt{2}}$$

V_s	Gain A_m	f_0 (prac.)	f_1	f_2	B.W $(f_2 - f_1)$

$$f_0^2 = f_1 f_2$$

5.

DC power supply, multimeter



<u>Calculations</u>

$R_{Th} \Rightarrow$

$$R_1 = \frac{20 \times 20}{20 + 20} = 10K\Omega$$

$$R_2 = 10K\Omega + 10K\Omega = 20K\Omega \qquad R_{Th} = \frac{20 \times 20}{20+20} = 10K\Omega$$

$V_{Th} \Rightarrow$ • With 6V source only

$V_{o_1} = 2V$

• with −6V source only

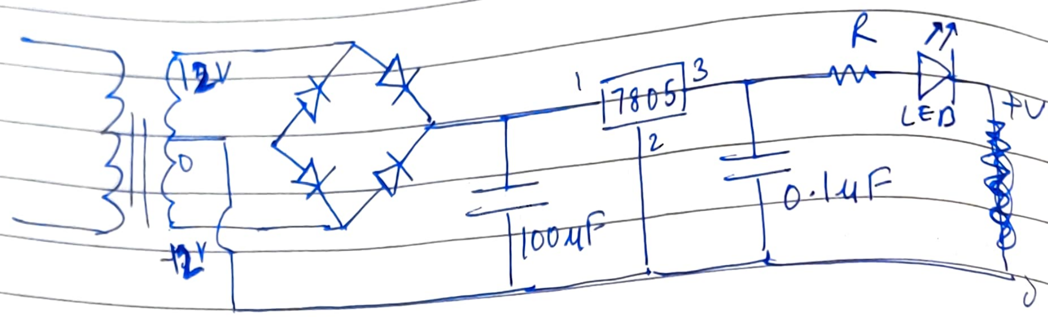
$V_{o_2} = -1V$

$$\left.\begin{matrix} V_{o_1} = 2V \\ V_{o_2} = -1V \end{matrix}\right\} V_{Th} = 1V$$

$$P = \frac{V_{Th}^2 \cdot R_L}{(R_{Th} + R_L)^2}$$

Date
Page

6.



Theory :

Step down Transformer reduces the high voltage AC to a lower AC voltage suitable for rectification.

Obs. :

Voltage across rectifier (o/p): (AC-RMS)

Across +ve : 5......

Voltage across regulator 7805 o/p: No edges (Graph is a st. line)

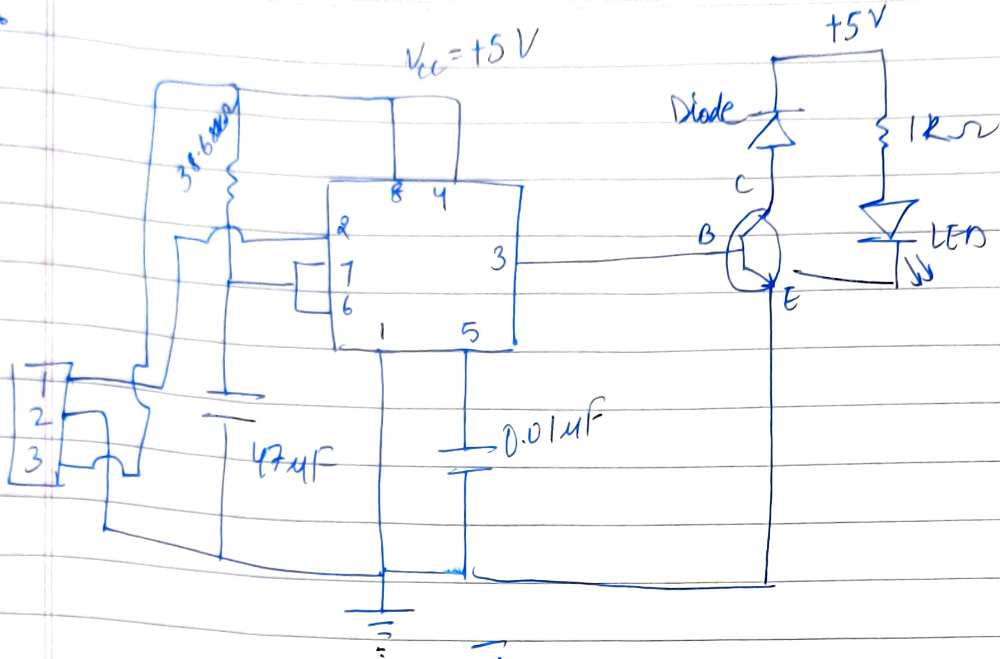
Result :

- The circuit succesfully converted 220V AC to 12V DC
- Voltage regulator provided stable output, almost equal to +5V and -5 V DC.
- LEDs connected to regular output lit up.

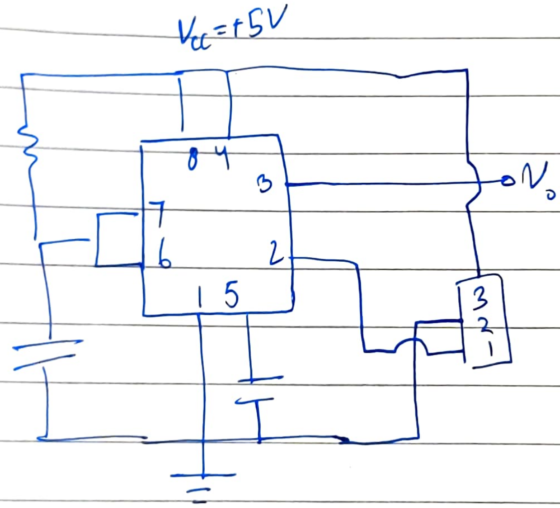
Conclusion :

The exp. demonstrated working of DC Power supply including voltage step down.

7.



OR

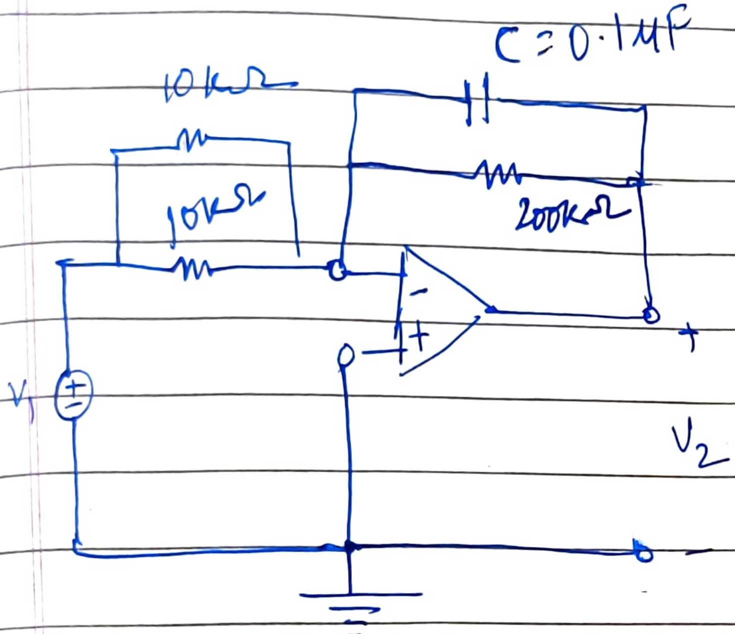


$T(ON) = \ln 3 \, R_{eff} \, C$

$R = 38.68 k\Omega$

S. No	C_3 value	Charging cycle Resistor value	ON Time duraⁿ (theo.)	(prac.)	Mode of Timer IC
Set circuit to get ON Time as 2 sec	47μF	38.68kΩ	2		Monostable

8.



$C = 0.1\mu F$
$R_1 = 10k\Omega$
$\omega = 2\pi f$
$f = 500Hz$

Theory:

~~Waveshape~~

The output of integrator follows: $V_2 = \frac{-1}{CR_2}\int v_1\,dt$

A sq. wave input results in triangular output.

Observations:

Waveshape	V_{1p}	V_{2p}	V_{2p}/V_{1p}	$T/4CR_1$ or $1/\omega CR_1$
Square				