Project # 3

Schmitt Trigger Design and Testing

[redacted]

Objective was to design and test a Schmitt trigger, using a standard [redacted] characteristics: [redacted] symmetric $\pm V_{cc}$, [redacted] With $V_{TH} - V_{TL} = 7V$ [redacted] $-6V$. [redacted] V_L values for [redacted] was chosen to be [redacted] for N_I, and [redacted] The test gave low enough not to reach $\pm V_{cc\,max} = \pm 18V$ for the chosen [redacted] the values for V_L and V_H to be $-11V$ and $+11V$; respectively. Thus the Schmitt trigger graph V_o vs V_I should have looked as shown in figure 1.

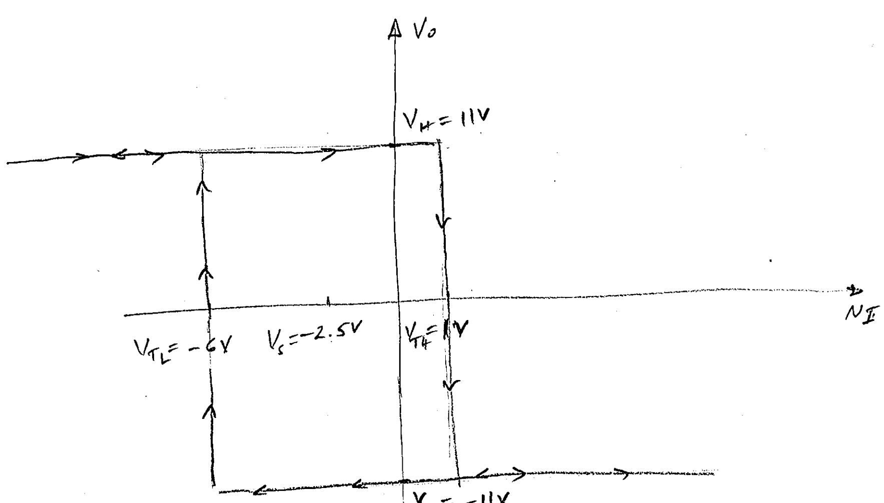

Figure 1. Voltage transfer characteristics

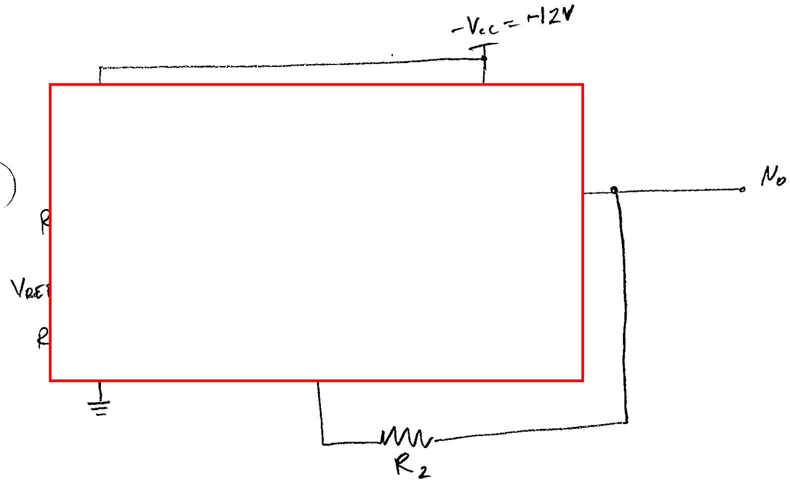

Figure 2. Schmitt Trigger Circuit

Figure 2 showed the circuit design used. Reference voltage for the circuit was pulled from the same power supply as $\pm V_{cc}$, then a voltage divider was created to adjust for the V_{REF} required value. Positive feedback circuit was used, and the component (resistor) values were calculated using equations below.

, $V_L = -11V$, $V_J = -2.5V$,

, and $V_{TL} = -6V$

so :

Convi

Plug

R_2

Thus, R_3 ...

73

Next st... kΩ, $R_2 = 2.2k\Omega$, $R_3 = 1k\Omega$,
and $R_4 = 2.2$ ... (approximately). Hysteresis
effect was ... d in the circuit and
$V_I = 8\ V_{p\text{-}p}$ ... t signal. However, the
values of V... rous on the X-Y graph.
This was de... the V_I was changing,
V^+ was al... e with the V_I sinusoidal
signal. This pr... es of R_1 and R_2.
By increasing the value of R_1, V_{REF} was more isolated from V^+ and the variation of V_{REF} was much smaller. Values of R_1 and R_2 were 22kΩ and 47kΩ, respectively. Values of R_3 and R_4 were kept the same as before. Resistor $R_1 \| R_2$ was changed to 15kΩ.

This circuit yielded net voltage transfer characteristics as shown in figure 3. On the x-axis V_I was presented and V_o on the y-axis. The x-cursors were measuring V_{TL} and V_{TH}, which were $-6V$ (x2) and $1V$ (x1) as required by the specifications. The y-cursors showed the values of V_L and V_H to be $-11V$ and $11V$.

Appendix A contained the MicroCap circuit and transient analysis, using sinusoidal signal as input, in figures 4 and 5. Also, Matlab simulation code and graph (figure 6) were presented in the appendix.

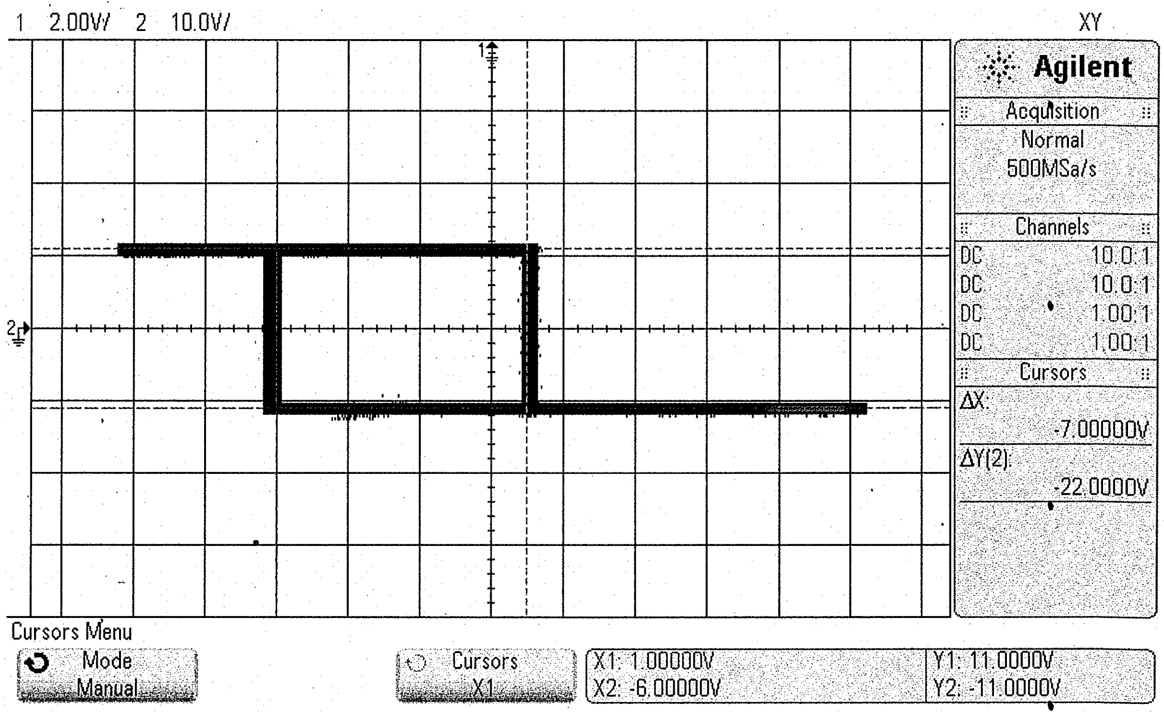

Figure 3. Circuit Net Voltage Characteristics

Appendix A:

Figure 4. MicroCap Circuit

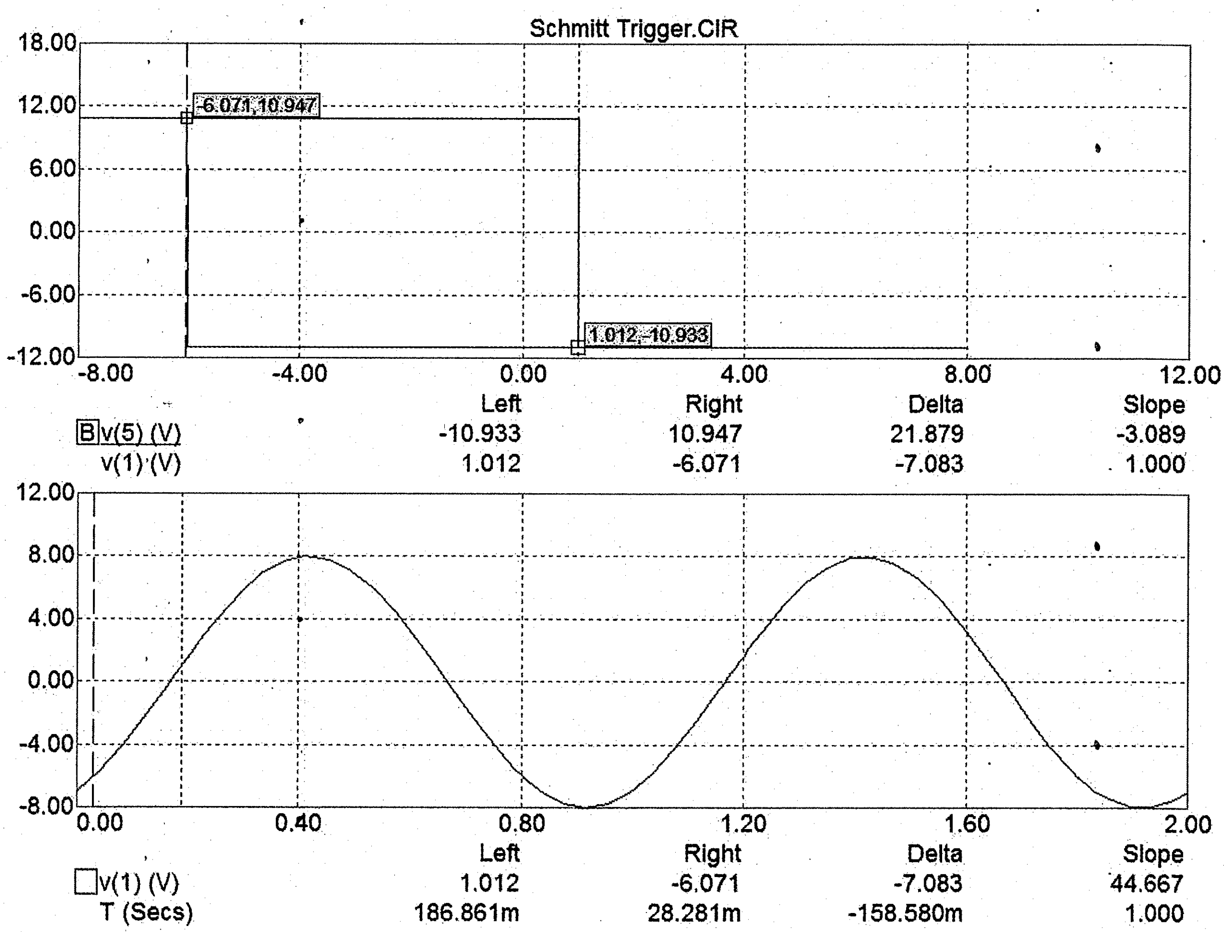

Figure 5. MicroCap Transient Analysis

Matlab Code:

```
%EE254 Project3
```

```
plot(vin,vol,'r')
hold on
stem(Vs,0,'b')
```

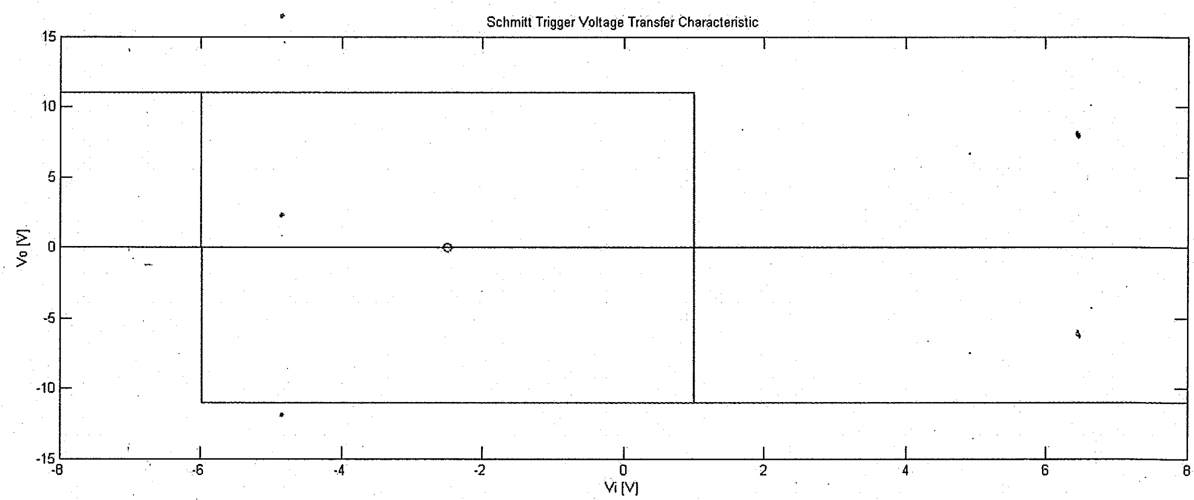

Figure 6. Matlab Simulation