ELECENG 2CJ4

Lab 4 Report

Analyzing First-order Circuits

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1. Introduction

2. Operational Principle of the experiment

We must determine the period and frequency voltage of the oscillator in Figure 9.

$$T = T_1 + T_2 = R_3 C \left[\ln\left(\frac{V_{sat}^{+} - V_{th2}}{V_{sat}^{+} - V_{th1}}\right) + \ln\left(\frac{V_{sat}^{-} - V_{th1}}{V_{sat}^{-} - V_{th2}}\right)\right] \rightarrow (17)$$

$$V_{th1} = \frac{R_2}{R_1 - R_2} V_{sat}^{+} = \frac{1k\Omega}{22k\Omega - 1k\Omega} \times 5V \approx 0.238V$$

$$V_{th1} = \frac{R_2}{R_1 - R_2} V_{sat}^{-} \approx -0.238V$$

Plugging in the required values into Eq.17:

$$T = 1k\Omega \times 100nF \left[\ln\left(\frac{5 + 0.238}{5 - 0.238}\right) + \ln\left(\frac{-5 - 0.238}{-5 + 0.238}\right)\right]$$

**use 1k or 22k??

Use 50k.

$T \approx 0.95\mu S$ **check with TA

Thus, the frequency can be found by:

$$f = \frac{1}{T}$$

3. Measurement results

The AD3 measurement results and their resulting waveforms and circuits are included below.

4. Discussion

Comparing Theoretical vs Measured Results:

$$percent\ difference = \frac{|C - M|}{\left(\frac{C + M}{2}\right)} \times 100$$

Generating a Triangular Output: