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Project 4 Results

Electric Circuit Analysis, ENGR 3100

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# Objective

Analyze the circuit from Figure 1 and determine the voltage of over time where . Simulate results in PSCPICE and use an oscilloscope to measure the voltages.

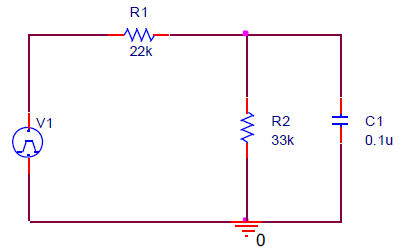


Figure 1, First Order Circuit

# Circuit Analysis to Find Total Response of The System

The circuit of Figure 1 was analyzed using node voltage analysis and resulted in the following equation:

Which results in the following differential equation in the time-domain:

The following work was performed to determine the piecewise total response of the circuit to V1:

Natural Response:

Forced Response:

=>

Total Response: =>

Forced Response:

=>

Total Response:

Forced Response: = 0

Total Response:

**MATLAB Graph of Total Response**

Figure 2 contains the code used to generate the MATLAB plot in Figure 3 of the circuits total response using the piecewise total response equations.

clc;

clear;

close all;

% piecewise time intervals

t1 = 0 : .005 : .01;

t2 = .01 : .005 : .02;

t3 = .02 : .005 : .03;

t = [t1 t2 t3];

% piecewise total responses

VC1\_1 = -.898\*exp(-757.6.\*t1) + .899;

VC1\_2 = 1.79\*exp(-757.6.\*t2) - .899;

VC1\_3 = -.899\*exp(-757.6\*(t3-.02));

% plot total response over time

VC1 = [VC1\_1 VC1\_2 VC1\_3];

plot(t,VC1);

Figure 2, MATLAB Program to Graph Response

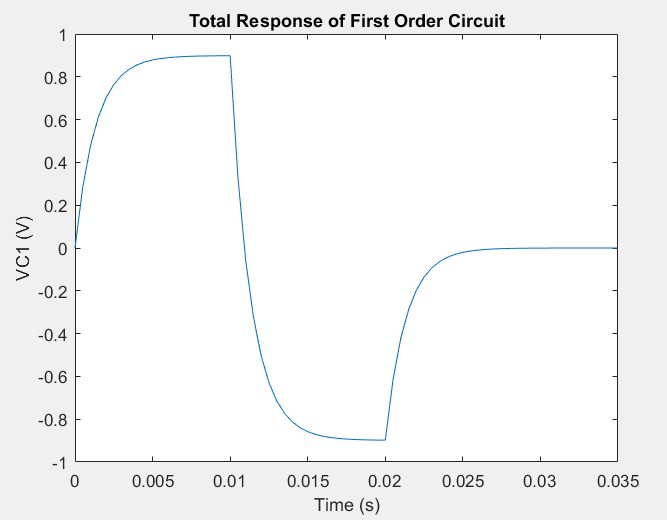


Figure 3, Total Response Plot



# Verification Using PSpice

The circuit in Figure 1 was entered in OrCAD Capture and simulated to verify the analytically determined total response as graphed in Figure 3. Figure 4 contains the circuit schematic and Figure 5 contains the time-domain graph of V1, the input, as the blue square waves and the response of as the red trace.

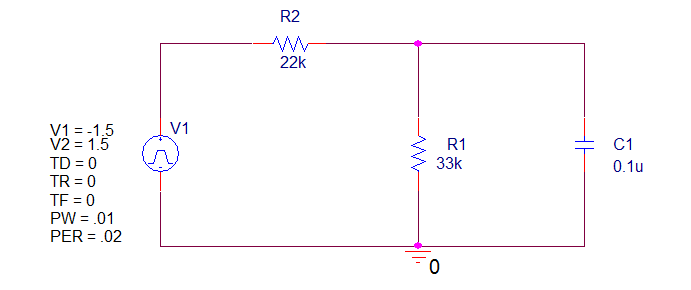


Figure 4, OrCAD Capture Schematic

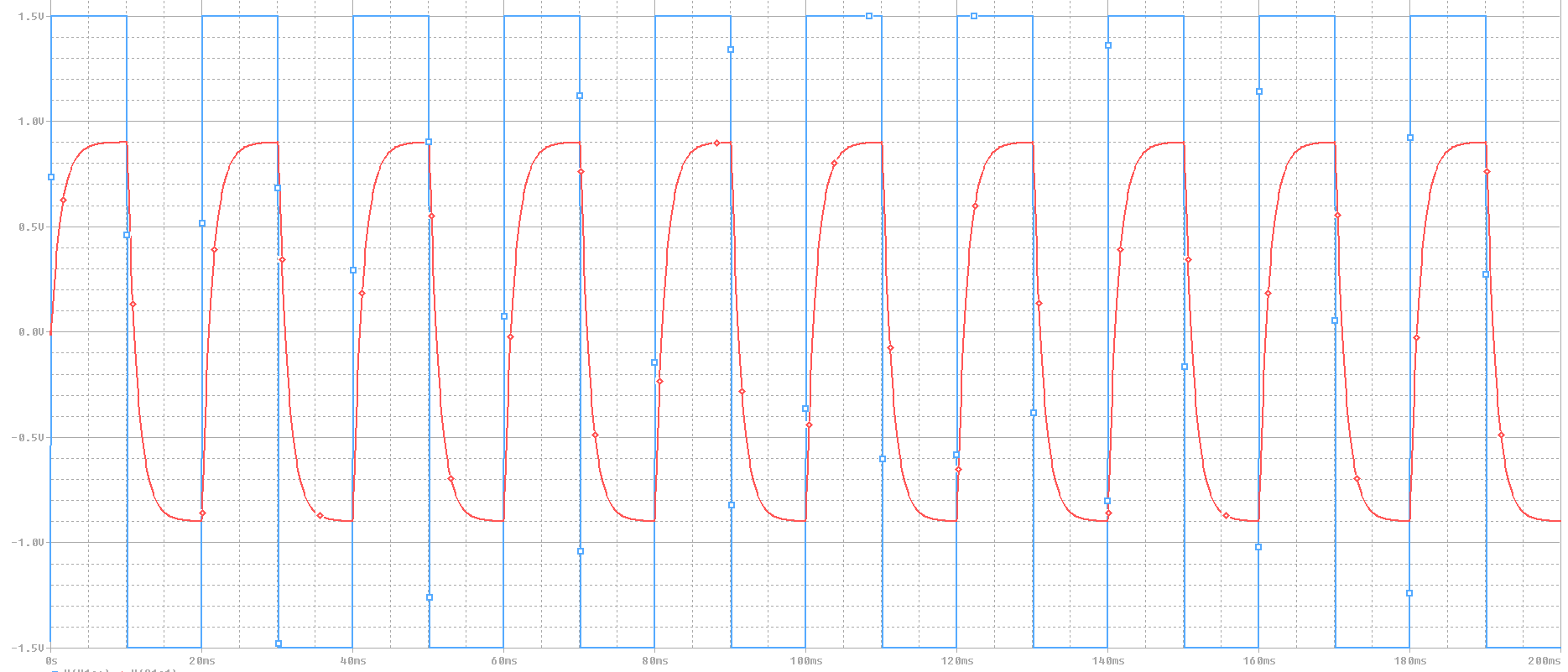


Figure 5, OrCAD Capture Simulation

**Oscilloscope Verification**

Figure 6 contains the simulation screenshots from an oscilloscope attached to the circuit set up on a CADET protoboard. The oscilloscope was attached to the input and the output, . The orange trace is the input and the blue trace is the output.

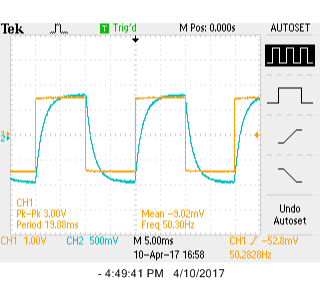


Figure 6, Oscilloscope