Project 01

ECE 317

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Contents

1 Circuit 1

1.1 Circuit Diagram

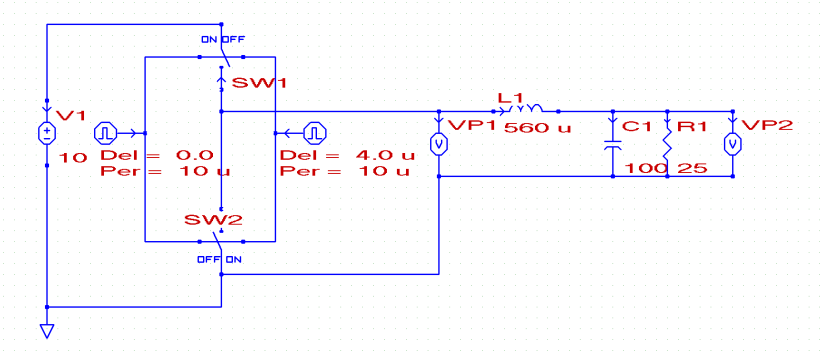

Figure 1: Circuit

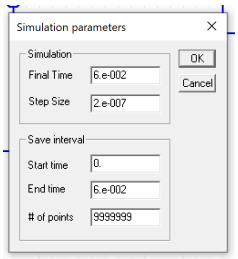

Figure 2: Simulation Parameters

1.2 Output

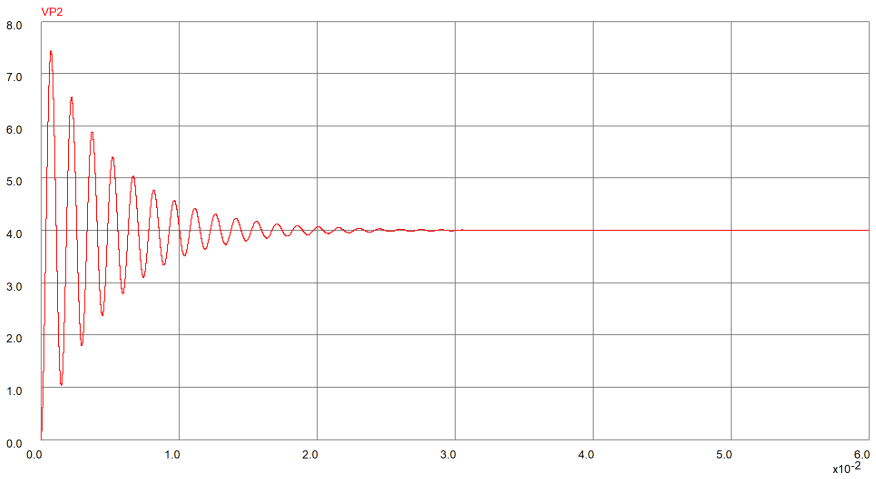

Figure 3: Full waveform

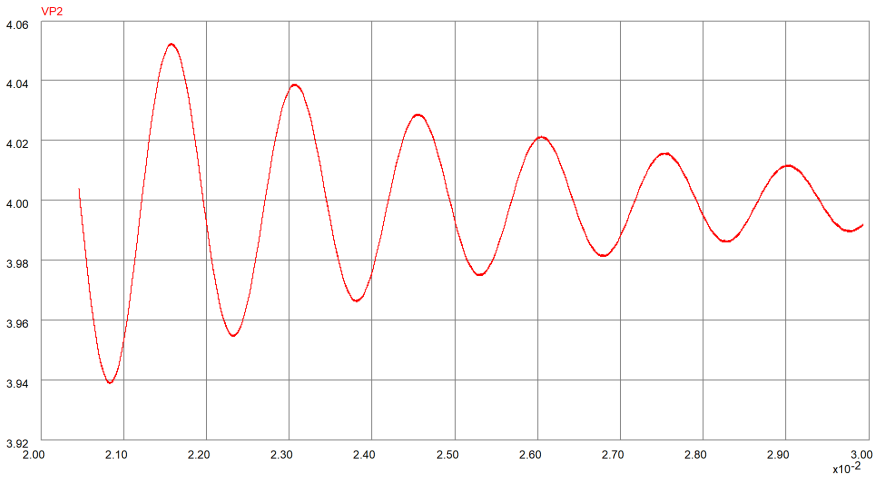

Figure 4: Zoomed waveform

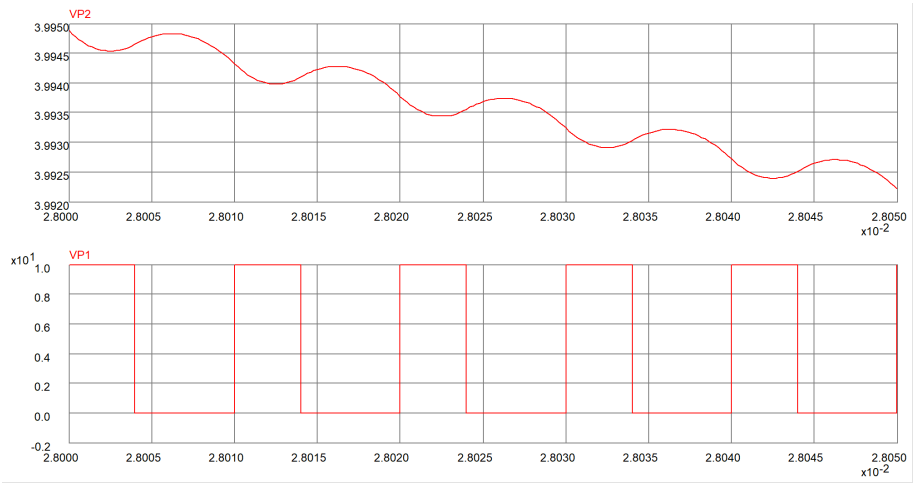

Figure 5: Comparitive waveform

Peak Amplitude	**Period**	**Pulse Width**	**Duty Ratio**
$10v$	10μs	4μs	0.4

Table 1: Circuit 1 calculations

Question

Taking the above plots into consideration, explain why you would expect to get the steady state value you found above?

Answer

$$Steady\ State = Peak\ Amplitude \cdot Duty\ Ratio \tag{1}$$

It is expected to get the steady state above as the peak voltage is $10v$ and the duty ratio is 0.4.

2 Circuit 2

2.1 Circuit Diagram

Figure 6: Circuit

Figure 7: Simulation Parameters

2.2 Output

Figure 8: Comparative waveform

Peak Amplitude	**Period**	**Pulse Width**	**Duty Ratio**
$10v$	10μs	4μs	0.4

Table 2: Circuit 2 calculations

Question

Given that $K_1 = -1$, what other factors in the circuit determines the peak amplitude and why?

Answer

$$Steady\ State = Peak\ Amplitude \cdot Duty\ Ratio \tag{2}$$

It is expected to get the steady state above as the peak voltage is $10v$ and the duty ratio is 0.4.

3 Circuit 2

3.1 Circuit Diagram

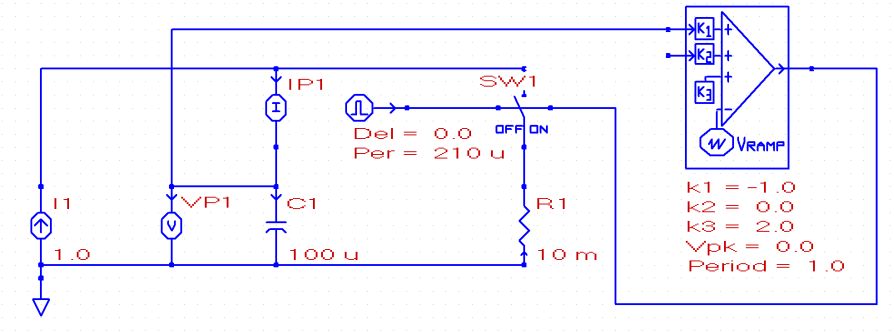

Figure 9: Circuit

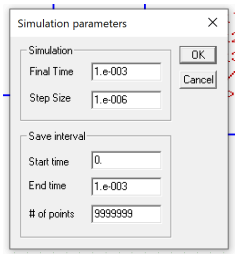

Figure 10: Simulation Parameters

3.2 Output

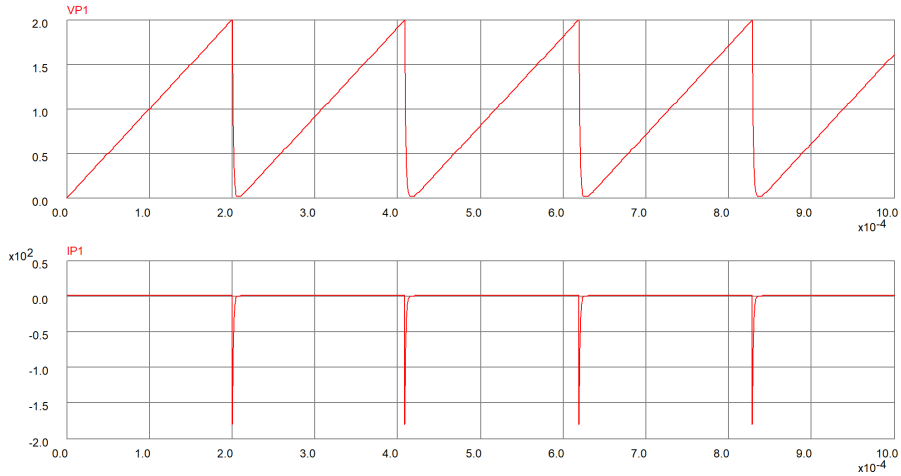

Figure 11: Comparative waveform

	Switching Frequency	**Duty Ratio**	**Peak-to-peak Input Voltage to Filter**	**Steady State Average Output Voltage**	**Peak-to-peak Output Voltage Ripple**
Circuit 1					
Circuit 3					

Table 3: Comparitive omnibus

Question

Explain the differences seen in the peak-to-peak ripple voltage values between Circuit 3 and Circuit 1. Are they in line with your expectations? Why?

Answer

The ripple is smaller in circuit 3 because the capacitor is being charged and discharged more frequently. This results in a smaller ripple voltage as seen in the above plots.