Circuit Analysis Report

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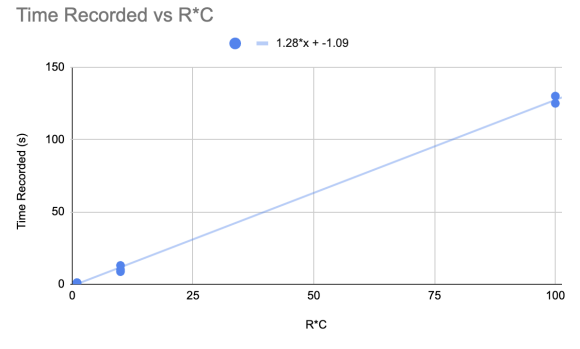
1 Determining Circuit Response

Table 1: Time (ms) that the LED was lit for combinations of resistance and capacitance.

		Capacitance (μF)				
		0.1	1	10	100	1000
Resistance (kΩ)	0.1	–	–	–	–	–
	1	–	–	–	–	1.27
	10	–	–	–	1.38	12.81
	100	–	–	1.12	14.89	145.59
	1,000	–	1.31	10.54	153.25	–

Figure 1: Comparison of predicted and actual LED lit times using the given relationship.



From the data collected on my circuit in Table 1, I verified that the relationship between the time the LED was lit and the resistance and capacitance

connected to pins 6 and 7 on the 555 timer could be approximated as (R, C) = 1.1RC, as the slope of my best-fit line was about 1.2RC. The strong linear relationship as determined by an R2 value of 0.89 between the predicted and actual time lit shown in Figure 1 leads me to believe that this is the correct relationship.

2 Analyzing Circuit Function

Table 2: Time (ms) that the LED was lit for the combination of a 1KΩ resistor and a 1F capacitor. The predicted time using the relationship I determined was 10 seconds.

Time (s)				
1.25	1.15	1.26	1.18	1.16
1.16	1.2	1.21	1.24	1.21
1.2	1.18	1.22	1.27	1.22
1.2	1.19	1.24	1.19	1.19
1.21	1.23	1.18	1.24	1.2

Figure 2: Time the LED was lit for the combination of a 1KΩ resistor and a 1F capacitor. The predicted time using the relationship given was 1.21 seconds.

Analyzing the data shown above in Table 2 and Figure 2 leads me to further confirm the given relationship, (R, C) = 1.1RC. The variability in time lit between my data and my partner's and the offset from the expected time can be explained by differences in circuit efficiencies (use of longer/shorter wires) and capacitor/resistor tolerances.