Lab 11 – RC Lab

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The purpose of this lab is to:

Experiment with RC (Resistor & Capacitor) circuits.

The following capacitors are needed (1 each of the following): 0.47uF, 1uF and 2.2uF

Measure and record the resistor value using the DMM and measure and record the capacitor values using the LCR meter in Table 1. Connect the resistor and capacitor as shown in Figure 1. Connect the Function Generator to the input at V1 and connect Channel 1 of the Oscilloscope to the input and Channel 2 to the output. Adjust the voltage of the Function Generator to 1Vpp at the frequencies shown in Table 2. Measure the input and output voltages using the Oscilloscope. Record the results in Table 2.

Change the capacitor and retest.

Equipment needed:



Figure 1

**RC Circuit**

1 – Digital Multimeter

1 – LCR Meter

1 – Oscilloscope

1 – Function Generator

1 – Elvis II

3 – capacitors

1 – resistor

|  |  |  |
| --- | --- | --- |
|  | Capacitance or Resistance | |
|  | Expected | Measured |
| C1 = | 0.47uF | 0.416uF |
| C2 = | 1uF | 0.794uF |
| C3 = | 2.2uF | 2.149uF |
| R1 = | 1kΩ | 993.5Ω |

Table 1 – Resistance and Capacitances

Expected = value you expect it to be

Measured = using LCR Meter or DMM

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Output Voltage C = 0.47uF | | | Output Voltage C = 1uF | | | Output Voltage C = 2.2uF | | |
|  | Expected | Measured | | Expected | Measured | | Expected | Measured | |
| Frequency | Output Voltage (mV) | Input Voltage | Output Voltage (mV) | Output Voltage (mV) | Input Voltage | Output Voltage (mV) | Output Voltage (mV) | Input Voltage | Output Voltage (mV) |
| 10 | 999.564 | 1.02 | 1020 | 998.031 |  |  | 990.581 |  |  |
| 50 | 989.264 |  |  | 953.992 | 1.02 | 980 | 822.563 | 1.0 | 800 |
| 100 | 959.055 | 1.02 | 960 | 846.733 |  |  | 586.134 |  |  |
| 200 | 860.962 |  |  | 622.670 | 1.02 | 672 | 340.201 | 1.0 | 304 |
| 300 | 747.406 | 1.0 | 740 | 469.160 |  |  | 235.304 |  |  |
| 400 | 646.097 |  |  | 369.801 | 1.02 | 424 | 178.049 | 1.0 | 164 |
| 500 | 560.750 | 1.0 | 560 | 303.368 |  |  | 143.233 |  |  |
| 600 | 491.887 |  |  | 257.272 | 1.0 | 296 | 120.236 | 0.98 | 114 |
| 700 | 436.481 | 1.0 | 440 | 222.880 |  |  | 103.442 |  |  |
| 800 | 389.952 |  |  | 195.246 | 0.98 | 228 | 90.126 | 0.98 | 88 |
| 900 | 353.418 | 1.0 | 360 | 175.152 |  |  | 80.640 |  |  |
| 1,000 | 320.737 |  |  | 157.176 | 0.98 | 188 | 72.155 | 0.98 | 74 |
| 2,000 | 166.975 | 1.0 | 184 | 79.346 |  |  | 36.157 |  |  |
| 3,000 | 112.681 |  |  | 53.232 | 1.02 | 74 | 24.224 | 1.02 | 29 |
| 4,000 | 84.396 | 1.02 | 104 | 39.777 |  |  | 18.091 |  |  |
| 5,000 | 67.590 |  |  | 31.824 | 1.0 | 45.6 | 14.471 | 1.02 | 19.6 |
| 6,000 | 56.611 | 1.0 | 72 | 26.641 |  |  | 12.113 |  |  |
| 7,000 | 48.631 |  |  | 22.878 | 1.02 | 34.4 | 10.401 | 1.0 | 15.6 |
| 8,000 | 42.321 | 1.0 | 58 | 19.905 |  |  | 9.049 |  |  |
| 9,000 | 37.846 |  |  | 17.798 | 1.02 | 26.8 | 8.091 | 1.0 | 11.4 |
| 10,000 | 33.843 | 1.0 | 48 | 15.913 | 1.0 | 24.8 | 7.234 | 1.0 | 11 |

RC Frequency Response

Expected = value you expect it to be

Measured = Using Oscilloscope

Observations: Voltage is lowest when frequency is highest.