**Experiment 23**: RL and RLC circuits

(Edit this document as needed)

Partner 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Partner 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Part A*

Plot of current in the LR circuit for R = 470Ω and L = 10mH.

Frequency of square wave such that the circuit reached steady state

|  |  |
| --- | --- |
| Source Frequency | [Hz] |

Calculated time constant for the LR circuit.

|  |  |
| --- | --- |
| τcalculated | [s] |

Measured time constant for the LR circuit.

|  |  |
| --- | --- |
| τmeasured | [s] |

How do the calculated and measured values compare?

Plot of current in the LR circuit for R = 10Ω and L = 10mH.

Frequency of square wave such that the circuit reached steady state

|  |  |
| --- | --- |
| Source Frequency | [Hz] |

Calculated time constant for the LR circuit.

|  |  |
| --- | --- |
| τcalculated | [s] |

Measured time constant for the LR circuit.

|  |  |
| --- | --- |
| τmeasured | [s] |

How do the calculated and measured values compare?

Resistance of a 10mH inductor.

|  |  |
| --- | --- |
| Rinductor | [Ω] |

Recalculation of the time constant.

|  |  |
| --- | --- |
| τrecalculation | [s] |

Are the measured and calculated values now closer?

*Part B*

Plot of capacitor voltage in the RLC circuit for R = 100Ω, C = 0.01μF and L = 10mH.

Frequency of square wave such that the circuit reached steady state

|  |  |
| --- | --- |
| Source Frequency | [Hz] |

Period of the sinusoid

|  |  |
| --- | --- |
| T | [s] |

Experimentally found oscillation frequency

|  |  |
| --- | --- |
| βmeasured | [rad/s] |

Calculated oscillation frequency using component values

|  |  |
| --- | --- |
| βcalculated | [rad/s] |

Experimentally found attenuation constant

|  |  |
| --- | --- |
| αmeasured | [nepers] |

Calculated attenuation constant using component values

|  |  |
| --- | --- |
| αcalculated | [nepers] |

How did the calculated and measured values compare?

Plot of capacitor voltage in the RLC circuit for R = 10Ω, C = 0.01μF and L = 10mH.

Frequency of square wave such that the circuit reached steady state

|  |  |
| --- | --- |
| Source Frequency | [Hz] |

Period of the sinusoid

|  |  |
| --- | --- |
| T | [s] |

Experimentally found oscillation frequency

|  |  |
| --- | --- |
| βmeasured | [rad/s] |

Calculated oscillation frequency using component values

|  |  |
| --- | --- |
| βcalculated | [rad/s] |

Experimentally found attenuation constant

|  |  |
| --- | --- |
| αmeasured | [nepers] |

Calculated attenuation constant using component values

|  |  |
| --- | --- |
| αcalculated | [nepers] |

How did the calculated and measured values compare?

Was there a greater discrepancy for the circuit with 10Ω? Why?

Plots of capacitor voltage for other resistor values. Make sure you can clearly see the waveforms.

Due: April 14th, 2022 at 11:59 pm eastern on Gradescope

One student submits on Gradescope and adds their partner using “add group members” option on Gradescope.