Lab 3 - Results: Intro to AC Circuits

ECE209: *Fundamentals of Electrical Engineering*

Name	Student ID	CCID	Lab Section

Pre-lab Sign-off: _____ Results Sign-off: _____

AC Resistors – 100 Ω

		DMM	R_1 (Ω) =	
Freq	**100 Hz**	**1 kHz**		**10 kHz**
Oscilloscope – Method 1 – *Counting Divisions*				
Horizontal - # of divs				
SEC/DIV				
$\mathbf{T_S}$ – Period (*s*)				
Vertical - # of divs				
VOLTS/DIV				
$\mathbf{V_R^{Pk\text{-}Pk}}$ – peak-to-peak (*V*)				
Oscilloscope – Method 2 - *Cursors*				
$\mathbf{T_S}$ – Period (*s*)				
$\mathbf{F_S}$ – Frequency (*Hz*)				
$\mathbf{V_R^{Pk\text{-}Pk}}$ – peak-to-peak (*V*)				
Oscilloscope – Method 3 – *Automatic Measurements*				
$\mathbf{f_S}$ – 'Freq' (*Hz*)				
$\mathbf{T_S}$ – 'Period' (*s*)				
$\mathbf{V_R^{Pk\text{-}Pk}}$ – 'Pk-Pk' (*V*)				
$\mathbf{V_R^{RMS}}$ – 'Cyc RMS' (*V*)				
DMM – Milliammeter – *RMS current*				
$\mathbf{I_R^{RMS}}$ – (*mA*)				
Calculate Resistance – (*$R = V_{RMS}/I_{RMS}$***)**				
R (Ω)				

AC Capacitors – 68 nF

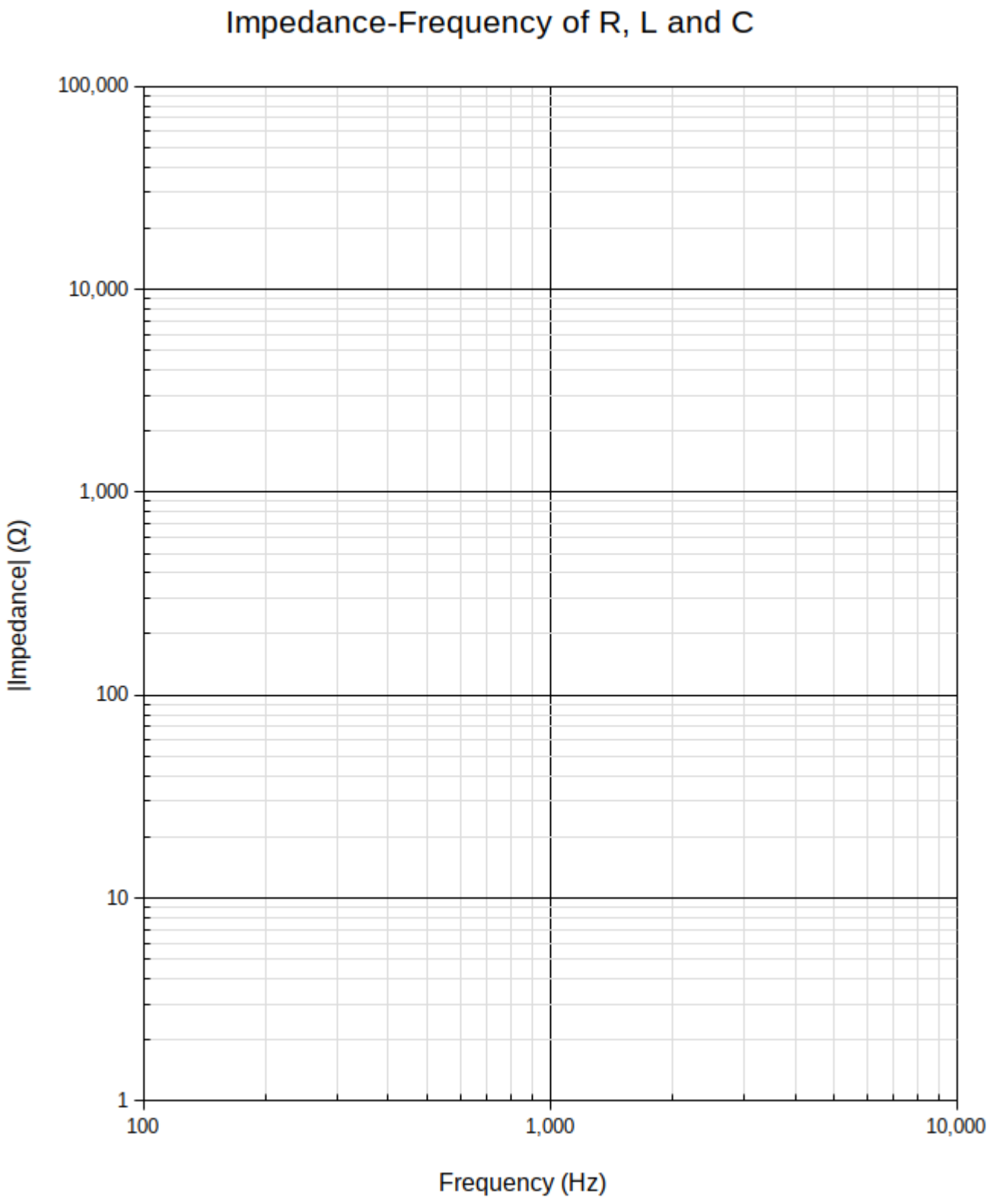
		DMM	**C_1 (nF) =**		**R_{C1} (Ω) =**	
Freq	**X_C**	**F_S**	**V_C^{RMS}**	**I_C^{RMS}**	**X_C**	**C**
(Hz)	(Ω)	(Hz)	(V)	(mA)	(Ω)	(nF)
100 *Hz*						
1 *kHz*						
10 *kHz*						

AC Capacitors – 1 µF

		DMM	**C_2 (nF) =**		**R_{C2} (Ω) =**	
Freq	**X_C**	**F_S**	**V_C^{RMS}**	**I_C^{RMS}**	**X_C**	**C**
(Hz)	(Ω)	(Hz)	(V)	(mA)	(Ω)	(nF)
100 *Hz*						
1 *kHz*						
10 *kHz*						

AC Inductors – 2.5mH

					DMM	**$R_{L1(\Omega)}$ =**	
Freq	**X_L**	**F_S**	**V_L^{RMS}**	**I_L^{RMS}**	**Z_L**	**X_L**	**L**
(Hz)	(Ω)	(Hz)	(V)	(mA)	(Ω)	(Ω)	(mH)
100 *Hz*							
1 *kHz*							
10 *kHz*							


Impedance-Frequency of R, L and C
100,000
10,000
1,000
100
10
1
|Impedance| (Ω)
100
1,000
10,000
Frequency (Hz)

Series RC Circuit

Freq	**(*Hz*)**	**100 *Hz***	**1 *kHz***	**10 *kHz***	**f_S where $V_C = V_R$**
Oscilloscope – *Setup 1*					
f_S - Freq	(*Hz*)				
T_S - Period	(*s*)				
V_S^{RMS}	(*V*)				
V_C^{RMS}	(*V*)				
$t_{C\text{-}S}$ - phase diff	(*s*)				
V_C (**leads/lags**) V_S	(leads/lags)				
DMM *– Milliammeter – RMS current*					
I_S^{RMS}	(*mA*)				
Oscilloscope – *Setup 2*					
V_R^{RMS}	(*V*)				
$t_{R\text{-}S}$ - phase diff	(*s*)				
V_R (**leads/lags**) V_S	(leads/lags)				
Calculations					
$\theta_{C\text{-}S}$	(°)				
$\theta_{R\text{-}S}$	(°)				
$\theta_{C\text{-}R}$ = ($\theta_{C\text{-}S}$+$\theta_{R\text{-}S}$)	(°)				
R *– (ohms law)*	(*Ω*)				
X_C *– (ohms law)*	(*Ω*)				
Z = *(R+X_C)*	(*Ω*)				
Z_{Calc}	(*Ω*)				
Z *– (ohms law)*	(*Ω*)				
C	(*nF*)				
R - *(phase)*	(*Ω*)				
X_C - *(phase)*	(*Ω*)				

Series RL Circuit

Freq	**(*Hz*)**	**100 *Hz***	**1 *kHz***	**10 *kHz***	**f_S where $V_L = V_R$**
Oscilloscope – *Setup 1*					
f_S - Freq	(*Hz*)				
T_S - Period	(*s*)				
V_S^{RMS}	(*V*)				
V_L^{RMS}	(*V*)				
$t_{L\text{-}S}$ - phase diff	(*s*)				
V_L (**leads/lags**) V_S	(leads/lags)				
DMM – Milliammeter – *RMS current*					
I_S	(*mA*)				
Oscilloscope – *Setup 2*					
V_R^{RMS}	(*V*)				
$t_{R\text{-}S}$ - phase diff	(*s*)				
V_R (**leads/lags**) V_S	(leads/lags)				
Calculations					
$\theta_{L\text{-}S}$	(°)				
$\theta_{R\text{-}S}$	(°)				
$\theta_{L\text{-}R} = \theta_{L\text{-}S} + \theta_{R\text{-}S}$	(°)				
R – *(ohms law)*	(*Ω*)				
Z_L – *(ohms law)*	(*Ω*)				
X_L = (Z_L-R_L)	(*Ω*)				
Z_{Calc}	(*Ω*)				
Z – *(ohms law)*	(*Ω*)				
L	(*mH*)				