Experiment 1

Linear and Nonlinear Elements

Student's Name: ____________________ Student's No.:____________

Partner's Name: _____________________ Partner's No.:____________

Instructors Name:____________________ Section No.:_____________

Date: ______________

…………………………………………………………………………….

Carbon Resistor		Si Diode		Light bulb (low currents)		Light Bulb (high currents)	
V (Volts)	I (mA)	V (Volts)	I (mA)	V (Volts)	I (mA)	V (Volts)	I (mA)
0.4		0.4		0.010		0.5	
0.8		0.45		0.02		1.0	
1.2		0.50		0.03		1.5	
1.6		0.53		0.04		2.0	
2.0		0.55		0.05		2.5	
2.4		0.57		0.06		3.0	
2.8		0.60					
3.2		0.62					
3.6		0.64					
4.0		0.66					
4.4		0.68					
4.8		0.70					

Experiment 2

Impedance Matching and Internal Resistance

Student's Name: ____________________________ Student's No.:_____________________________

Partner's Name: ____________________________ Partner's No.:_____________________________

Instructors Name:___________________________ Section No.:_______________________________

Date: ______________

Note: max voltage 10 volts!

R_L (KΩ)	I(mA)	I^{-1} $(mA)^{-1}$	I^2 $(mA)^2$	$P_L = I^2 R_L$ (mW)
0.1				
0.3				
0.5				
0.7				
0.8				
0.85				
0.9				
0.95				
1.0				
1.05				
1.1				
1.2				
1.5				
2.0				
3.0				
5.0				
7.0				
10.0				
20.0				
50.0				

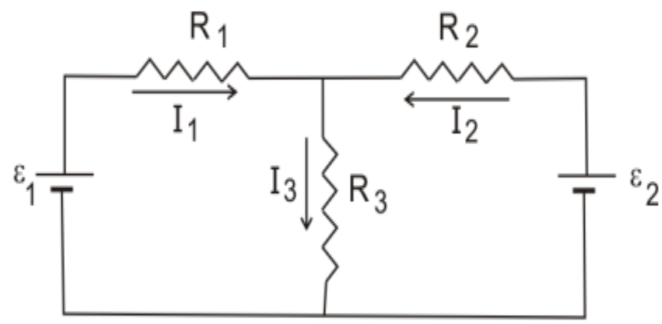
Experiment 3
Room 253 – Network analysis 1: The SPP and Kirchhoff's law

Student's Name: ______________________________ Student's No.:________________________________
Partner's Name: ______________________________ Partner's No.:_______________________________
Instructors Name:____________________________ Section No.:___________________________________
Date: _______________

1) Kirchhoff's Laws

Connect the circuit shown:

R1= 1 kΩ,
R2= 3.3 kΩ,
R3= 6.2 kΩ,
ε1= 8 V,
ε2= 4 V.

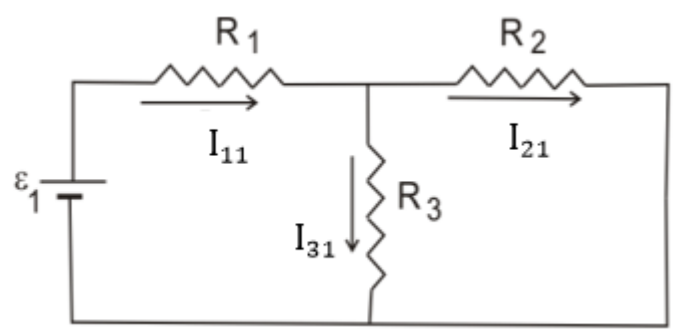


Measure the currents:

	experiment	calculation
I_1 (mA)		
I_2(mA)		
I_3 (mA)		

2) Superposition Principle

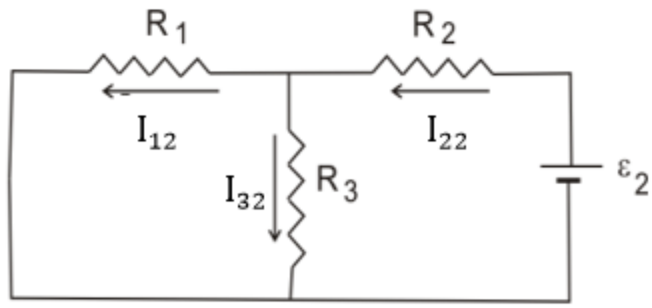
A) Connect the circuit shown:



Measure the currents:

	experiment	calculation
I_{11} (mA)		
I_{21}(mA)		
I_{31} (mA)		

B) Connect the circuit shown:



Measure the currents:

	experiment	calculation
I_{12} (mA)		
I_{22}(mA)		
I_{32} (mA)		

C) Find the current using SPP

$I_1 =$

$I_2 =$

$I_3 =$

Experiment 4
Room253–Network analysis 2: Thevenin and Norton technique

Student's Name: ______________________________ Student's No.:______________________________

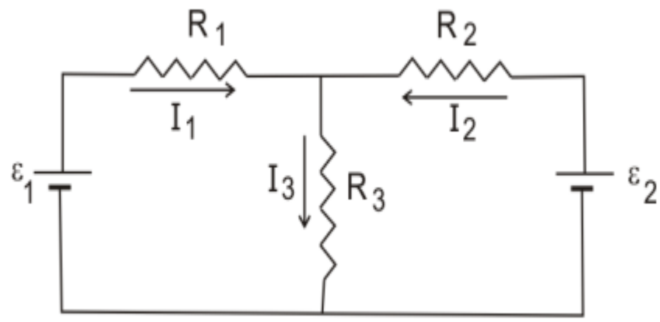
Partner's Name: ______________________________ Partner's No.:______________________________

Instructors Name:______________________________ Section No.:______________________________

Date: _______________

Connect the circuit shown:

R1= 1 kΩ,
R2= 3.3 kΩ,
R3= 6.2 kΩ,
ε1= 8 V,
ε2= 4 V.



A) When $I_1 = I_L$

1) Fill the following table:

	experiment	calculation
R_{eq1}		
ε_{eq1}		
I_{eq1}		

2) Construct **Thevenin** equivalent circuit:

	experiment	calculation
I_{L1} (mA)		

3) Construct **Norton** equivalent circuit

	experiment	calculation
I_{L1} (mA)		

B) When $I_3 = I_L$

1) Fill the following table:

	experiment	calculation
R_{eq3}		
ε_{eq3}		
I_{eq3}		

2) Construct **Thevenin** equivalent circuit:

	experiment	calculation
I_{L3} (mA)		

3) Construct **Norton** equivalent circuit

	experiment	calculation
I_{L3} (mA)		

Experiment 5
Digital Storage Oscilloscope (DSO)

with the instructor

EXPERIMENT 6
CAPACITORS AND INDUCTORS

Student's Name: ______________________________ Student's No.:________________________________
Partner's Name: ______________________________ Partner's No.:________________________________
Instructors Name:_____________________________ Section No.:__________________________________
Date: _______________

R= C=find best value! L=10mH

Part1: RC-circuit

Show V_c on the DSO		Show V_R on the DSO
Draw what you see on the screen of the DSO		Draw what you see on the screen of the DSO
Find $\tau_c =$	Find $\tau_d =$	
$\tau_{exp} =$		$\tau_{theo} =$

Part2: LR-circuit

Show V_L on the DSO		Show V_R on the DSO
Draw what you see on the screen of the DSO		Draw what you see on the screen of the DSO
Find $\tau_c =$	Find $\tau_d =$	
$\tau_{exp} =$		$\tau_{theo} =$

Part 3: LC-circuit

<table>
<tr><td colspan="3">Show V_c on the DSO</td></tr>
<tr><td colspan="3">Draw what you see on the screen of the DSO</td></tr>
<tr><td rowspan="2">Resonance frequency</td><td>$f_{\circ exp} =$</td><td>$\omega_{\circ exp} =$</td></tr>
<tr><td>$f_{\circ theo} =$</td><td>$\omega_{\circ theo} =$</td></tr>
</table>

Experiment 7

Damped Oscillations

Student's Name: ____________________ Student's No.:____________

Partner's Name: ____________________Partner's No.:____________

Instructors Name:___________________Section No.:_____________

Date: ______________

……………………………………………………………………………

$C = \text{find best value!}$ $L = 10\ \text{mH}$ $f = (300 - 1000)\ Hz$

-Data:

Part (1): Critical-Damping

Show V_C on the DSO	
Draw what you see on the screen of the DSO	
$R_{Critical} =$	$\delta_{C,Theo} =$
$t_{\frac{1}{2}exp} =$	$\delta_{C,Exp} =$

Part (2):Over-Damping

Show V_C on the DSO	
Draw what you see on the screen of the DSO	
R_{Over} =	$\delta_{C,Theo}$ =
$t_{\frac{1}{2}exp}$ =	$\delta_{C,Exp}$ =

Part (3):Under-Damping

Show V_C on the DSO	
Draw what you see on the screen of the DSO	
R_{under} =	$t_{\frac{1}{2}theo}$ =
$t_{\frac{1}{2}exp}$ =	$\delta_{C,Theo}$ =
$\delta_{C,exp}$ =	
f'_{exp} =	f'_{theo} =

EXPERIMENT 8

Impedance and Reactance

Student's Name: ______________________________ Student's No.:_______________________________

Partner's Name: ______________________________ Partner's No.:_______________________________

Instructors Name:_____________________________ Section No.:_________________________________

Date: _______________

C = 0.1µF L= 10 mH R=1 kΩ

Frequancy (KHz)	**Δt**	**Ω =2πf**	**Φ = ωΔt**
0.1			
0.3			
0.5			
0.7			
1.0			
3.0			
4.0			
4.5			
4.8			
5.0			
5.2			
5.5			
7			
20			
50.0			
70.0			
100.0			

Experiment 9

Resonance

Student's Name: ______________________________ Student's No.:_______________________________

Partner's Name: ______________________________ Partner's No.:_______________________________

Instructors Name:_____________________________ Section No.:_________________________________

Date: _______________

L=10mH; C=0.1μF; R=1kΩ

	$R = 1K\Omega$		$R = 2K\Omega$	
$f\,(kHz)$	$V_0(volt)$	$I_0(mA)$	$V_0(volt)$	$I_0(mA)$
0.2				
0.3				
0.5				
0.6				
0.8				
1.0				
2.0				
3.0				
4.0				
4.5				
5.0				
5.5				
7.0				
10.0				
20.0				
50.0				
80.0				

Experiment 10

Filters

Student's Name: ____________________________ Student's No.:_____________________________

Partner's Name: ____________________________ Partner's No.:_____________________________

Instructors Name:___________________________ Section No.:_______________________________

Date: ______________

$R = 1\ k\Omega$ $C = 0.1uF$ $V_{in_{rms}} = 4$ Volt

	Low-pass filter		High-pass filter	
ω (rad/sec)	$V_{0_{Out}}$(Volt)	A	$V_{0_{Out}}$(Volt)	A
1256				
1884				
3140				
3768				
5024				
6280				
7536				
9420				
11304				
12560				
18840				
31400				
50240				
62800				

-Data:

Type	Low-pass filter acts as integrator when $\omega \gg \omega_{-3dB}$	High-pass filter acts as differentiator when $\omega \ll \omega_{-3dB}$
Square wave		
Saw wave		
Sine wave		

Results and Calculations:

Graphs:

- Plot A vs.ω curve for both filters on semi-log graph paper.

Analysis of results:

1. What is the value of ω_{-3dB} for both filters from A vs.ω curve?
2. What is the phase relation between the input and the output voltages in both the un-attenuated and the highly attenuated regions for both filters?
3. Prove that the wave functions obtained in table (2) are the derivatives (in the case of high pass filter) and the integrals (in the case of low pass filter) of the respective of input voltage.
4. Compare between theoretical and experimental values of ω_{-3dB}.

1 2 3 4 5 6 7 8 9 10 2 3 4 5 6 7 8 9 10 2 3 4 5 6 7 8 9 10 2 3 4 5 6 7 8 9 10