Experiment 1

Linear and Nonlinear Elements

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

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

Instructors Name:____________________ Section No.:_____________

Date: ______________

………………………………………………………………………………………

Set V power supply = 4 Volts

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)
0.1		0.10		0.010		0.5	
0.4		0.20		0.02		1.0	
0.8		0.30		0.03		1.5	
1.2		0.40		0.04		2.0	
1.5		0.50		0.05		2.5	
1.8		0.55		0.06		3.0	
2.1		0.61					
2.4		0.64					
2.7		0.67					
3.0		0.70					
3.3		0.73					
3.5		0.76					

Experiment 2

Impedance Matching and Internal Resistance

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

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

Instructors Name:_____________________________ Section No.:_________________________________

Date: _______________

Set V power supply = 8 Volts

R_L (KΩ)	I(mA)	I^{-1} $(mA)^{-1}$	I^2 $(mA)^2$	$P_L = I^2 R_L$ (mW)
0.10				
0.15				
0.30				
0.60				
0.70				
0.85				
0.90				
0.95				
1.00				
1.05				
1.10				
1.20				
1.50				
2.00				
2.00				
4.00				
8.00				
15.0				
30.0				
60.0				

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.:____________________________

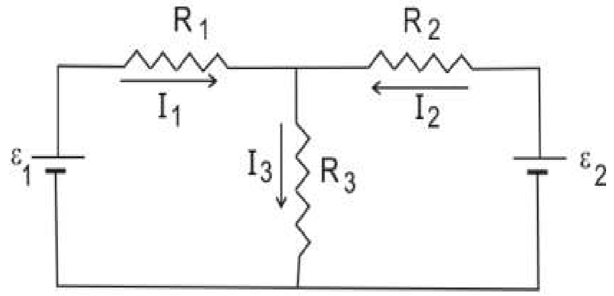
Instructors Name:__________________________ Section No.:_______________________________

Date: ______________

1) Kirchhoff's Laws

Connect the circuit shown:

R1= 1 kΩ,
R2= 3.3 kΩ,
R3= 6.2 kΩ,
ε1= 9 V,
ε2= 5 V.

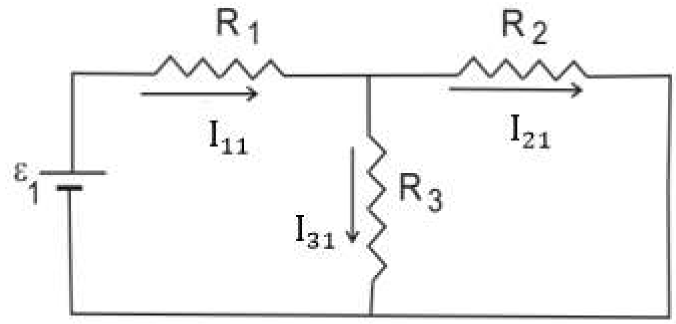


Measure the currents:

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

2) Superposition Principle

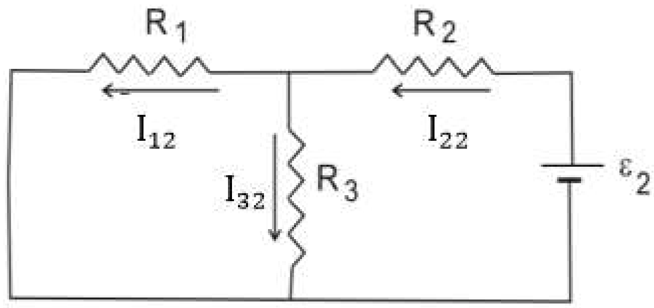
A) Connect the circuit shown:



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 3

<u>Room 263</u> – Network analysis 1: The SPP and Kirchhoff's law

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

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

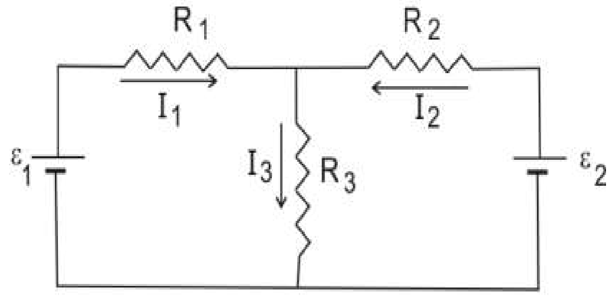
Instructors Name:__________________________ Section No.:_______________________________

Date: ______________

1) <u>Kirchhoff's Laws</u>

Connect the circuit shown:

R1= 1 kΩ,
R2= 2.2 kΩ,
R3= 5.1 kΩ,
ε1= 8 V,
ε2= 4 V.

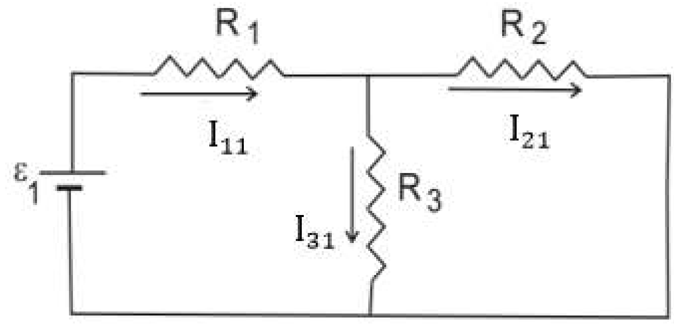


Measure the currents:

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

2) <u>Superposition Principle</u>

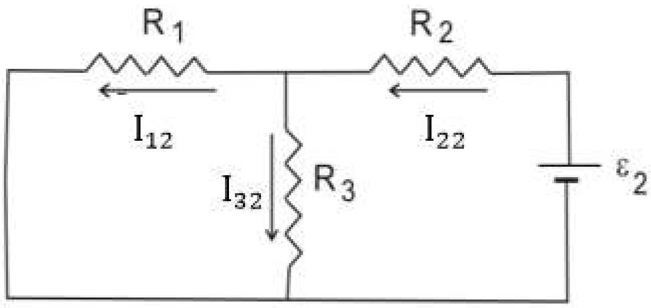
A) Connect the circuit shown:



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

<u>Room253</u>–Network analysis 2: Thevenin and Norton technique

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

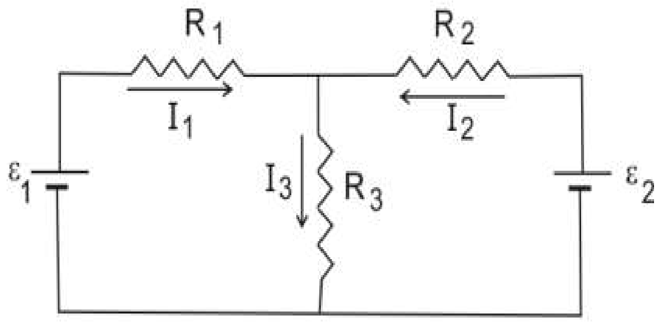
Partner's Name: ____________________________ Partner's No.:______________________________

Instructors Name:____________________________ Section No.:_______________________________

Date: ______________

Connect the circuit shown:

- R1= 1 kΩ,
- R2= 3.3 kΩ,
- R3= 6.2 kΩ,
- ε1= 10 V,
- ε2= 5 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 4

Room263–Network analysis 2: Thevenin and Norton technique

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

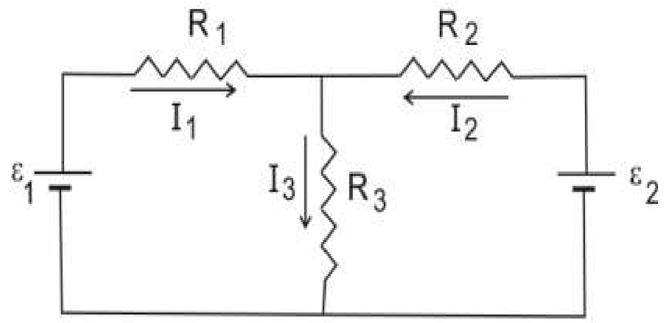
Partner's Name: ____________________________ Partner's No.:_____________________________

Instructors Name:___________________________ Section No.:_______________________________

Date: ______________

Connect the circuit shown:

R1= 1 kΩ,
R2= 2.2 kΩ,
R3= 5.1 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

DSO

No data sheet

EXPERIMENT 6

CAPACITORS AND INDUCTORS

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

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

Instructors Name:______________________________ Section No.:______________________________

Date: _______________

R=1kΩ C=find best value for you=_____ L=10mH

Part1: RC-circuit

<table>
<tr><td colspan="2">Show V_c on the DSO</td><td>Show V_R on the DSO</td></tr>
<tr><td colspan="2">Draw what you see on the screen of the DSO</td><td>Draw what you see on the screen of the DSO</td></tr>
<tr><td>Find $\tau_c =$</td><td>Find $\tau_d =$</td><td></td></tr>
<tr><td colspan="2">$\tau_{exp} =$</td><td>$\tau_{theo} =$</td></tr>
</table>

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

Show V_c on the DSO		
Draw what you see on the screen of the DSO		
Resonance frequency	$f_{\circ exp} =$	$\omega_{\circ exp} =$
	$f_{\circ theo} =$	$\omega_{\circ theo} =$

Experiment 7

Damped Oscillations

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

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

Instructors Name:_____________________________ Section No.:_________________________________

Date: _______________

…………………………………………………………………………………

$C =$ find best value $=$ _____ $\qquad L = 10\ \mathrm{mH} \qquad f = (300 - 1000)\ Hz$

-Data:

Part (1): Critical-Damping

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

Part (2):Over-Damping

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

Part (3):Under-Damping

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

EXPERIMENT 8

Impedance and Reactance

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

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

Instructors Name:______________________________ Section No.:______________________________

Date: _______________

C = 0.05μF L= 10 mH R=1 kΩ

$f\,(kHz)$	**Δt**	ω	**Φ = ωΔt**
0.2			
0.4			
0.8			
1.6			
3.0			
4.0			
5.0			
6.0			
6.5			
7.0			
7.5			
9.0			
15			
30			
50			
70			
99			

Experiment 9

Resonance

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

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

Instructors Name:______________________________ Section No.:______________________________

Date: _______________

L=10mH; C=0.05µF; R=1kΩ V_{PP}= 8 Volts

	R = 600Ω		*R = 1.2kΩ*	
$f(kHz)$	$V_0(volt)$	$I_0(mA)$	$V_0(volt)$	$I_0(mA)$
0.4				
0.6				
0.8				
1.0				
1.5				
3.0				
4.5				
6.0				
7.0				
8.0				
9.0				
15				
30				
60				
90				

Experiment 10

Filters

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

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

Instructors Name:______________________________ Section No.:______________________________

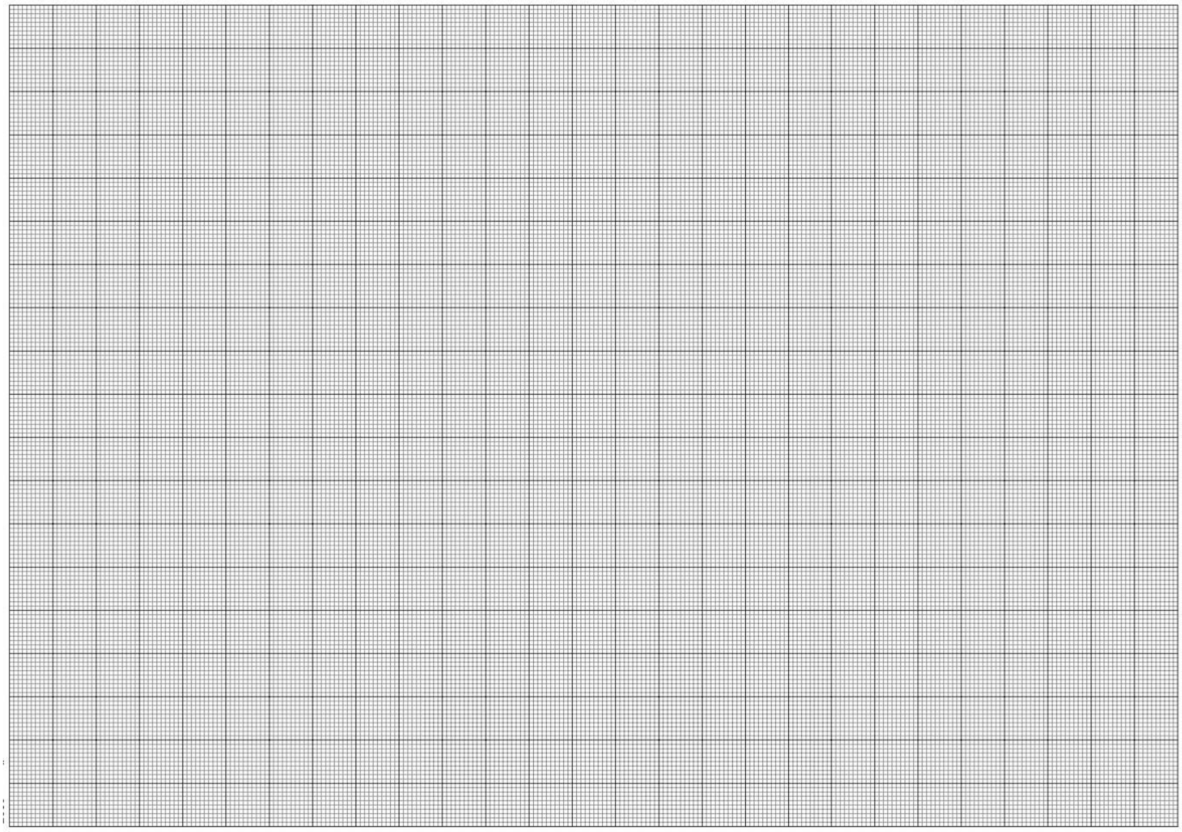
Date: _______________

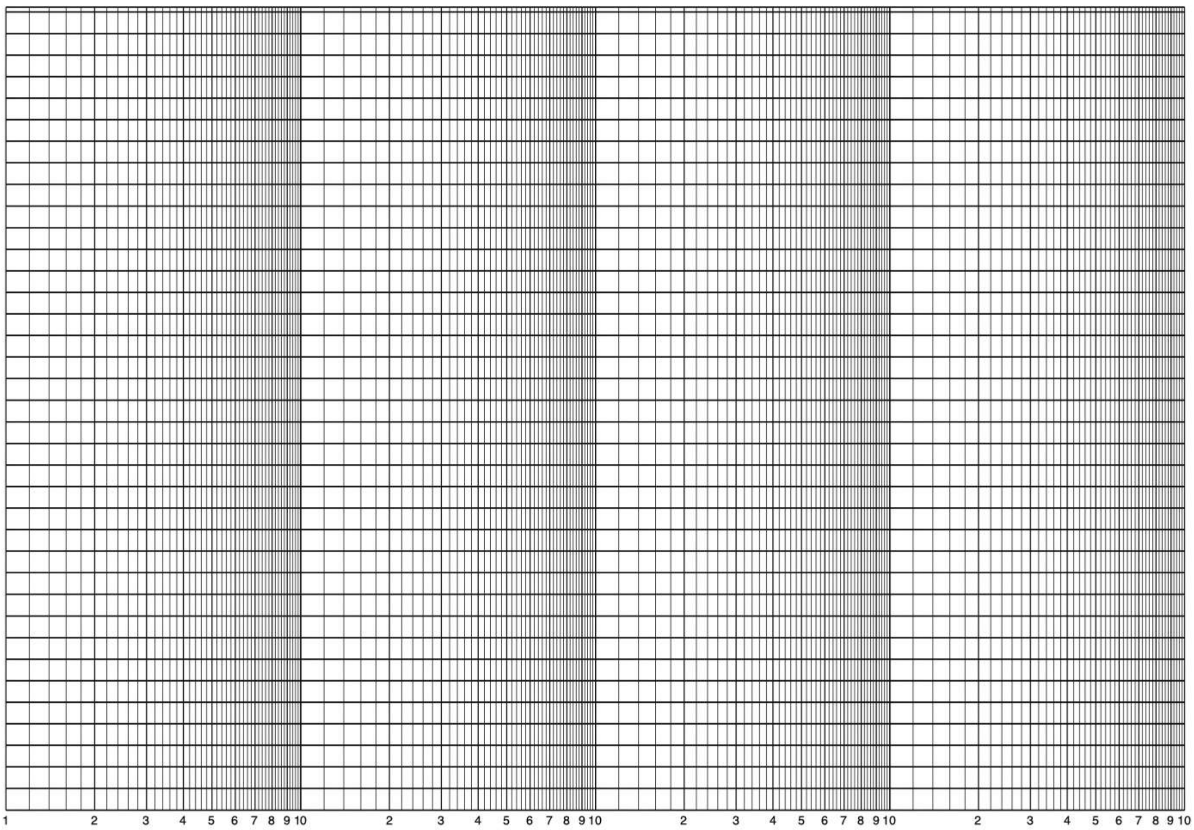
$R = 1\ k\Omega$ $C = 0.07\mu F$ $V_{in_{rms}} = 4\ Volt$

-Data:

		Low-pass filter		High-pass filter	
ω (rad/sec)	$f\,(kHz)$	$V_{Out}(Volt)$	A	$V_{Out}(Volt)$	A
1884					
3768					
5024					
6280					
8792					
10048					
11304					
12560					
14444					
16328					
18840					
21980					
25120					
31400					
62800					
94200					

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




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