Basic Electrical and Electronics Engineering

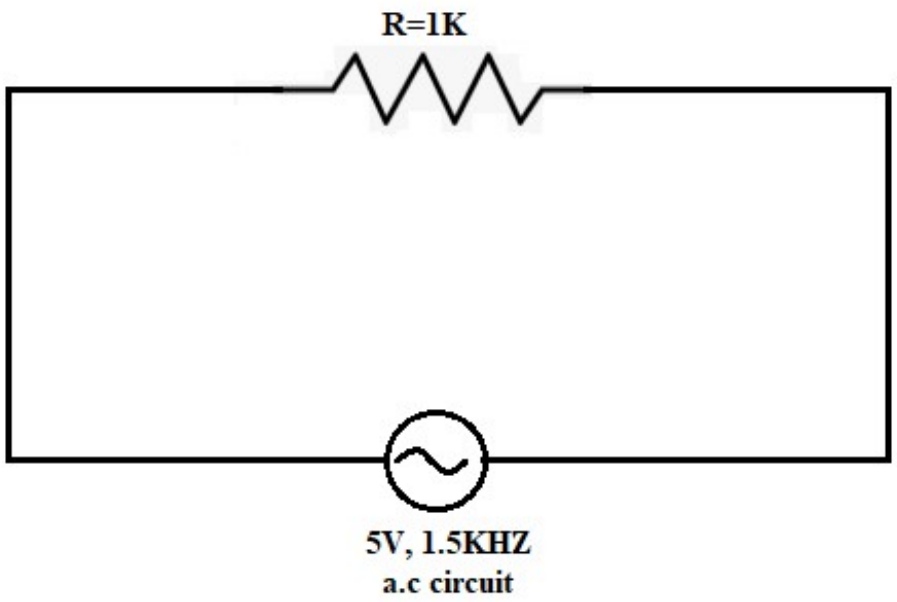
Experiment No. : 05
AC Circuit Analysis

Name : Ayush Jain

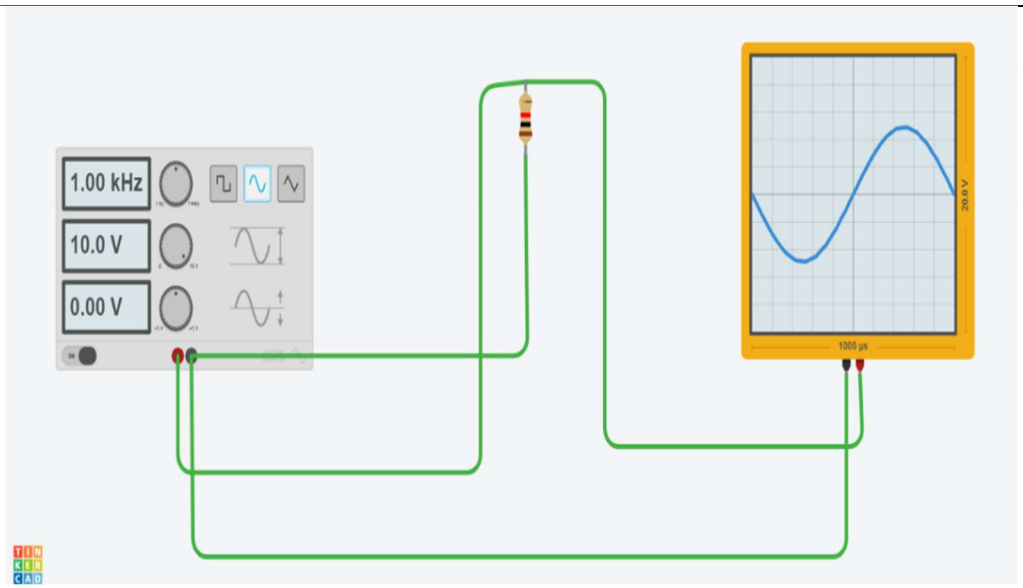
SAP No. : 60004200132

Date of performance : 03 |04 |2021

Signature of teacher-in-charge : _____

Aim:	A.C through 1) Resistor 2) R-L Series circuit 3) R-C Series circuit
Apparatus:	Online simulation tools (Suggested Tinkercad)
Theortical Analysis:	 ***Fig. 1(a) A.C through resistor*** ***<u>Theoretical Calculations:</u>*** V=IZ Since Z=R I=V/R Table 1

Sr. No.	Frequency	Current	Voltage	Resistance
1.	1000Hz	1mA	5V	1K ohm



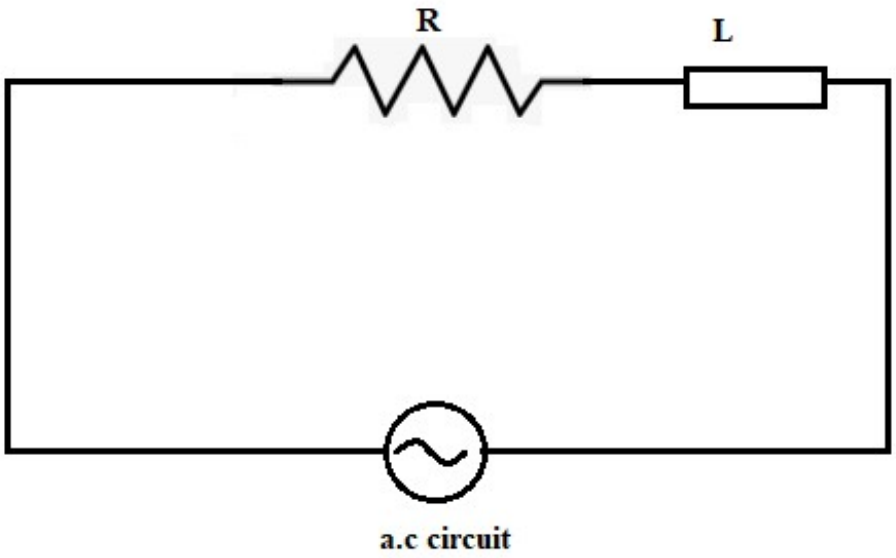
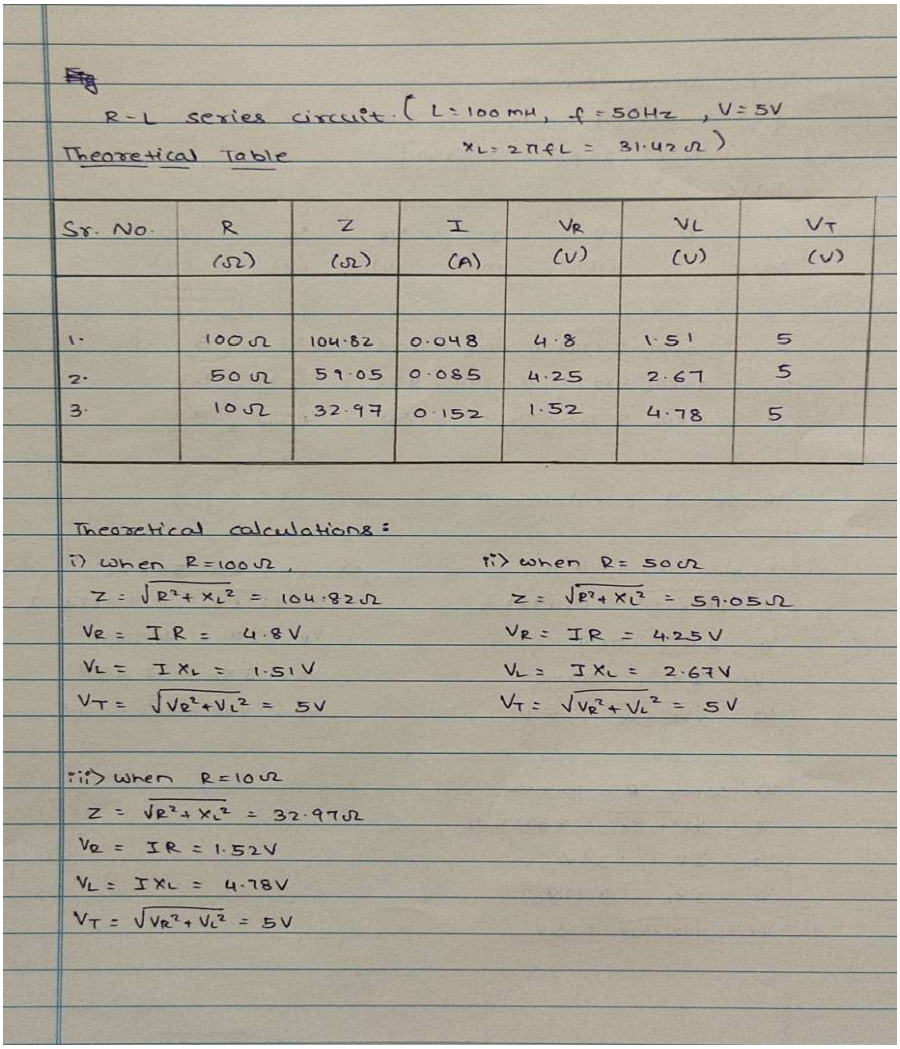


Fig. 1(b) R-L Series circuit

Theoretical Calculations:



R-L series circuit: (L = 100 mH, f = 50Hz, V = 5V
$X_L = 2\pi fL = 31.42\,\Omega$)

Theoretical Table

Sr. No.	R (Ω)	Z (Ω)	I (A)	V_R (V)	V_L (V)	V_T (V)
1.	100Ω	104.82	0.048	4.8	1.51	5
2.	50Ω	59.05	0.085	4.25	2.67	5
3.	10Ω	32.97	0.152	1.52	4.78	5

Theoretical calculations:

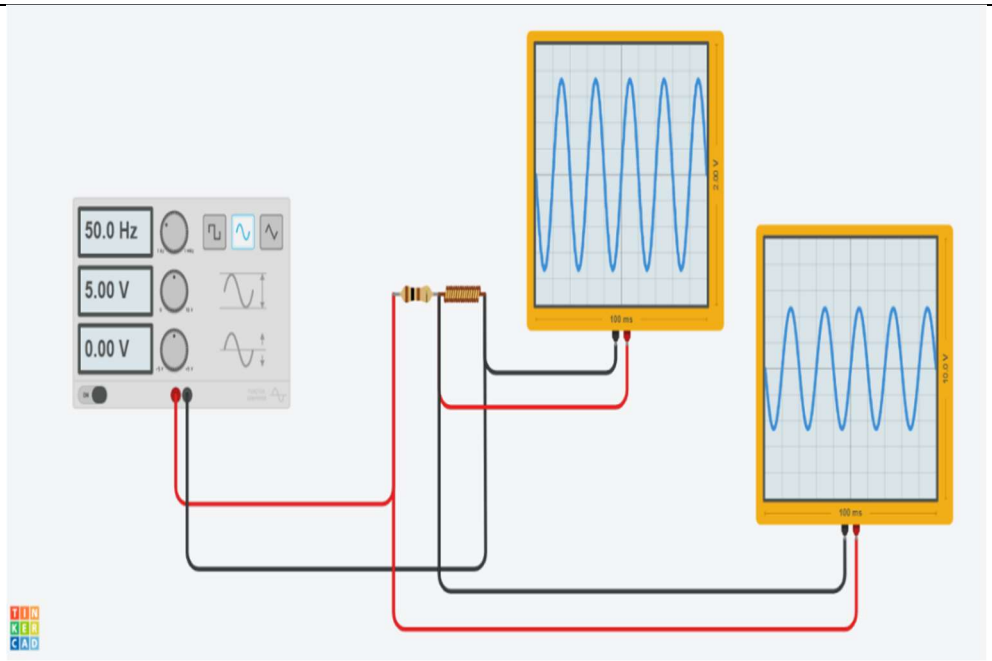
i) when $R = 100\,\Omega$,
$Z = \sqrt{R^2 + X_L^2} = 104.82\,\Omega$
$V_R = IR = 4.8\,V$
$V_L = IX_L = 1.51\,V$
$V_T = \sqrt{V_R^2 + V_L^2} = 5\,V$

ii) when $R = 50\,\Omega$
$Z = \sqrt{R^2 + X_L^2} = 59.05\,\Omega$
$V_R = IR = 4.25\,V$
$V_L = IX_L = 2.67\,V$
$V_T = \sqrt{V_R^2 + V_L^2} = 5\,V$

iii) when $R = 10\,\Omega$
$Z = \sqrt{R^2 + X_L^2} = 32.97\,\Omega$
$V_R = IR = 1.52\,V$
$V_L = IX_L = 4.78\,V$
$V_T = \sqrt{V_R^2 + V_L^2} = 5\,V$

Practical Calculations Table:

Sr. No.	**Resistance**	**Current**	**V_R**	**V_L**	**V_T**
1.	**100 ohm**	**47 mA**	**4.7 V**	**1.5 V**	**4.93 V**
2.	**50 ohm**	**82 mA**	**4.1 V**	**2.5 V**	**4.80 V**
3.	**10 ohm**	**150 mA**	**1.4 V**	**4.4 V**	**4.63 V**



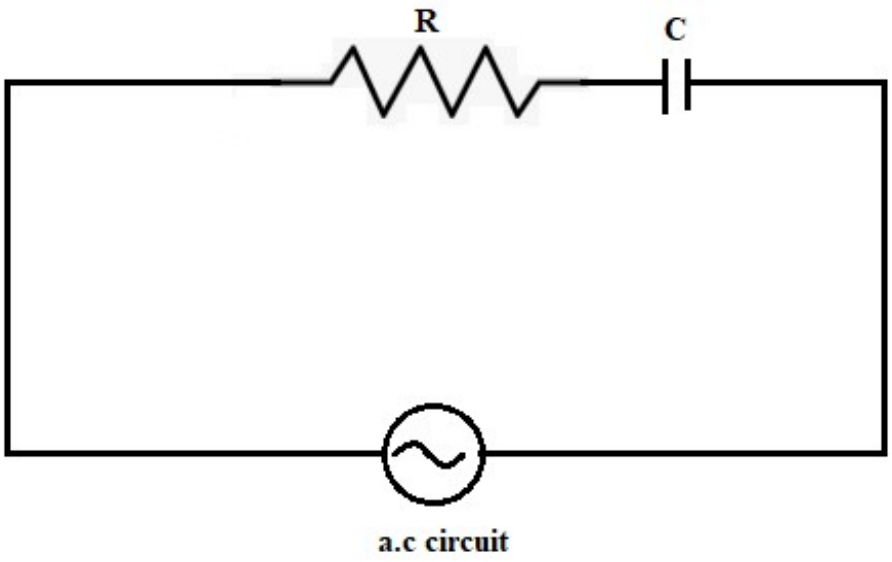
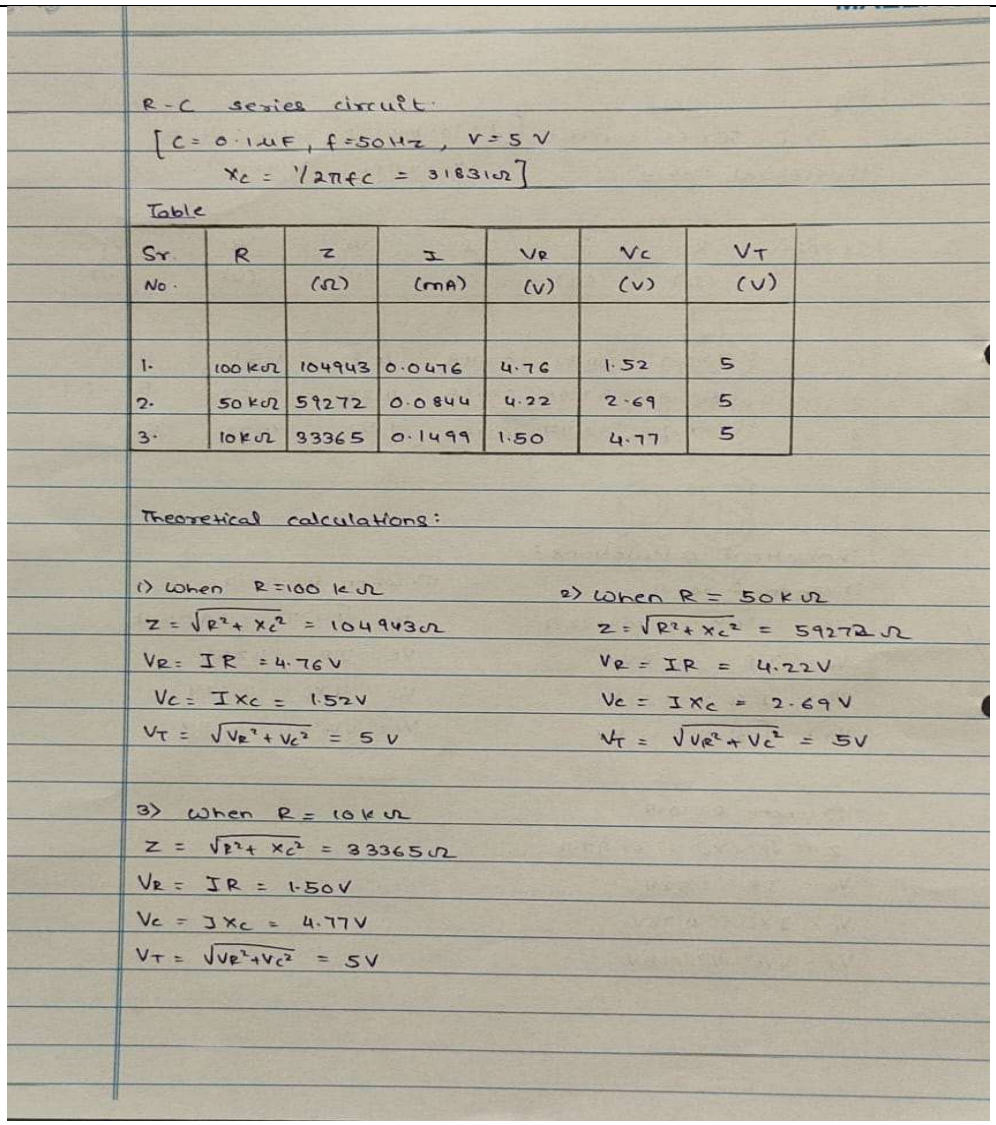


Fig. 1(c) R-C Series circuit



R-C series circuit

[C = 0.1 μF, f = 50 Hz, V = 5 V

$X_C = 1/2\pi fC = 31831\ \Omega$]

Table

Sr No.	R	Z (Ω)	I (mA)	V_R (V)	V_C (V)	V_T (V)
1.	100 KΩ	104943	0.0476	4.76	1.52	5
2.	50 KΩ	59272	0.0844	4.22	2.69	5
3.	10 KΩ	33365	0.1499	1.50	4.77	5

Theoretical calculations:

1) When R = 100 KΩ

$Z = \sqrt{R^2 + X_C^2} = 104943\ \Omega$

$V_R = IR = 4.76\ V$

$V_C = IX_C = 1.52\ V$

$V_T = \sqrt{V_R^2 + V_C^2} = 5\ V$

2) When R = 50 KΩ

$Z = \sqrt{R^2 + X_C^2} = 59272\ \Omega$

$V_R = IR = 4.22\ V$

$V_C = IX_C = 2.69\ V$

$V_T = \sqrt{V_R^2 + V_C^2} = 5\ V$

3) When R = 10 KΩ

$Z = \sqrt{R^2 + X_C^2} = 33365\ \Omega$

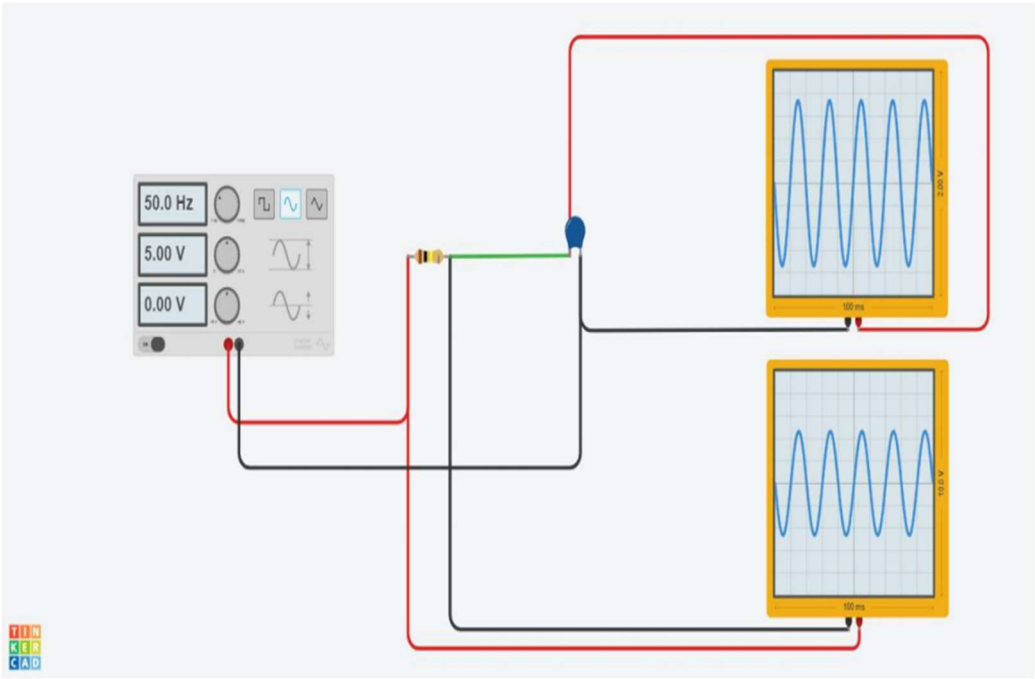
$V_R = IR = 1.50\ V$

$V_C = IX_C = 4.77\ V$

$V_T = \sqrt{V_R^2 + V_C^2} = 5\ V$

Practical Calculations Table:

Sr. No.	Resistance	Current	V_R	V_C	V_T
1.	100 K ohm	0.045 mA	4.5 V	1.44 V	4.72 V
2.	50 K ohm	0.084 mA	4.2 V	2.7 V	4.99 V
3.	10 K ohm	0.146 mA	1.46 V	4.6 V	4.826 V



Conclusion:

- **We applied properties and formulae of pure R,series R-L and series R-C circuit for theoretical calculations.**
- **The practical values have been attained using an online simulation tool, Tinkercad.**
- **The theoretical and measured values are almost equal to each other.**