MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

LAB MANUAL
FOR
ELECTRICAL CIRCUITS LAB

COURSE : B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

CLASS : II YEAR EEE/ I SEM

SUBJECT CODE: 80205

SUBJECT: Electrical Circuits Lab

LIST OF EXPERIMENTS:

1. Verification of Thevenin‘s & Norton‘s Theorems for the given circuit.

2. Verification of maximum Power Transfer Theorem for Excitation for the Given _T‘ Network.

3. Verification of Super Position Theorem for given electrical Network.

4. Verification of Compensation Theorem for DC Excitation for the given ‘T‘ Network.

5. Verification of Reciprocity Theorem for DC Excitation for the given electrical Network.

6. Experimental determination of Quality Factor, Bandwidth and resonant frequency for the given Series & Parallel RLC Circuit.

7. Experimental Determination of Z & Y Parameters for the given ‘T‘ network.

8. Experimental determination of Transmission & Hybrid Parameters for the given two port network.

Simulation Experiments:

9. Determination of branch currents in a given electrical circuit.

10. Determination of node voltages of a given electrical network.

11. Determination of transient response of a given RL & RC Circuit.

12. Determination of load current and voltage for a given electrical Network.

Experiment No: 1

THEVENIN’S AND NORTON’S THEOREM

THEVENIN'S CIRCUIT:-

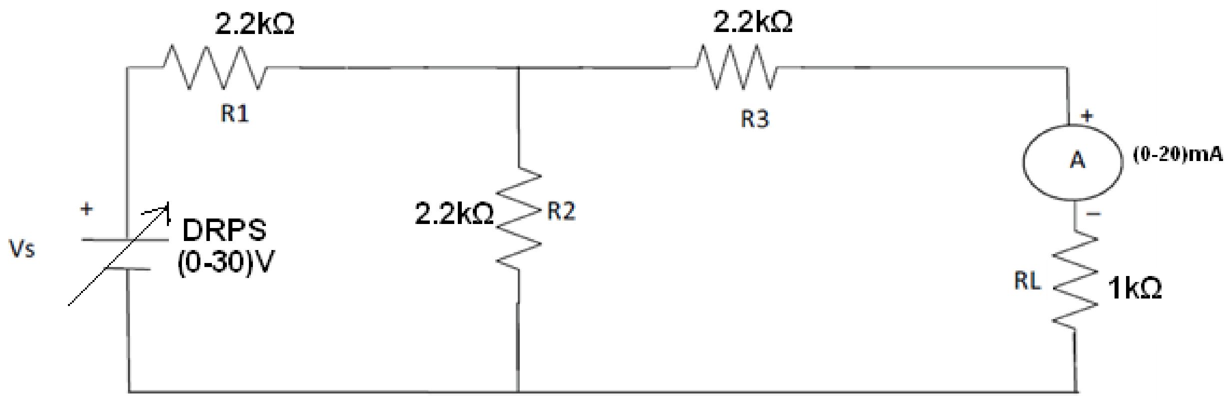


Fig (1a)

EQUIVALENT RESISTANCE CIRCUIT (R_{TH}):-

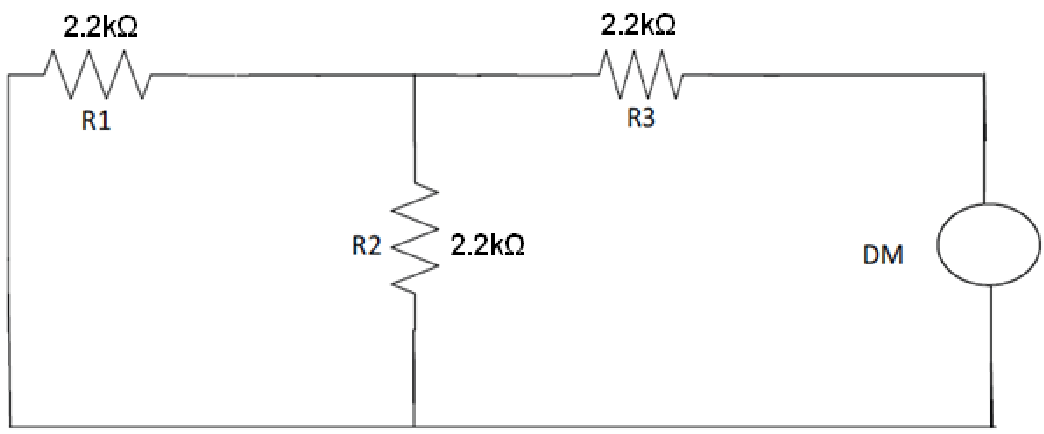
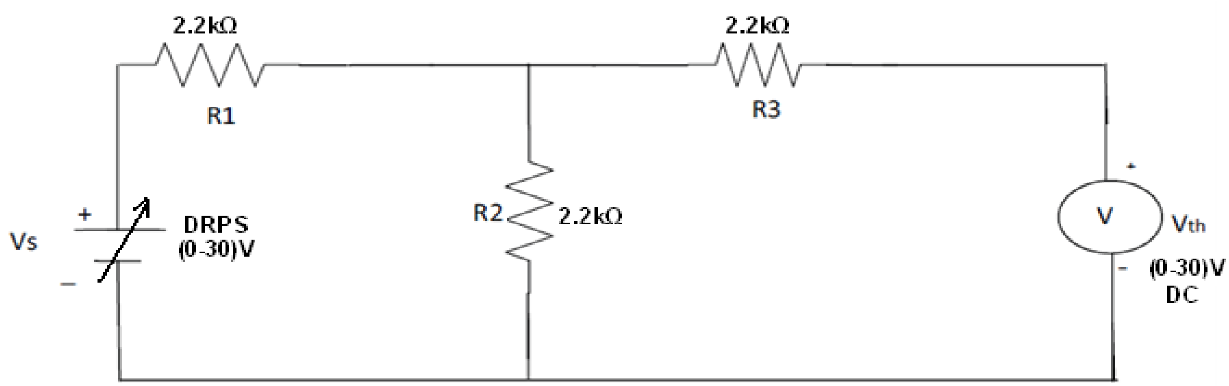


Fig (1.1a)

THEVENIN'S VOLTAGE (V_{TH}) CIRCUIT:-



Fig(1.2a)

EQUIVALENT CIRCUIT:

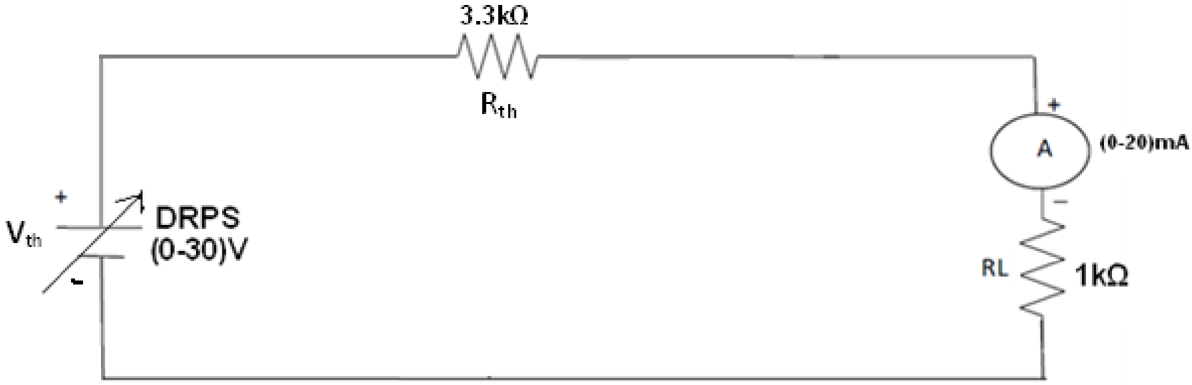


Fig (1.3a)

NORTON'S THEOREM:

NORTON'S CIRCUIT

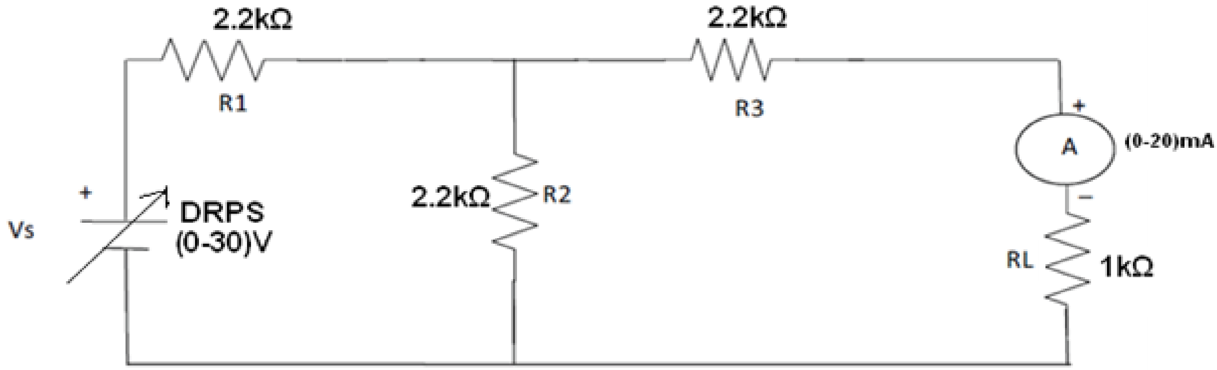


Fig (1.4a)

NORTONS CURRENT CIRCUIT

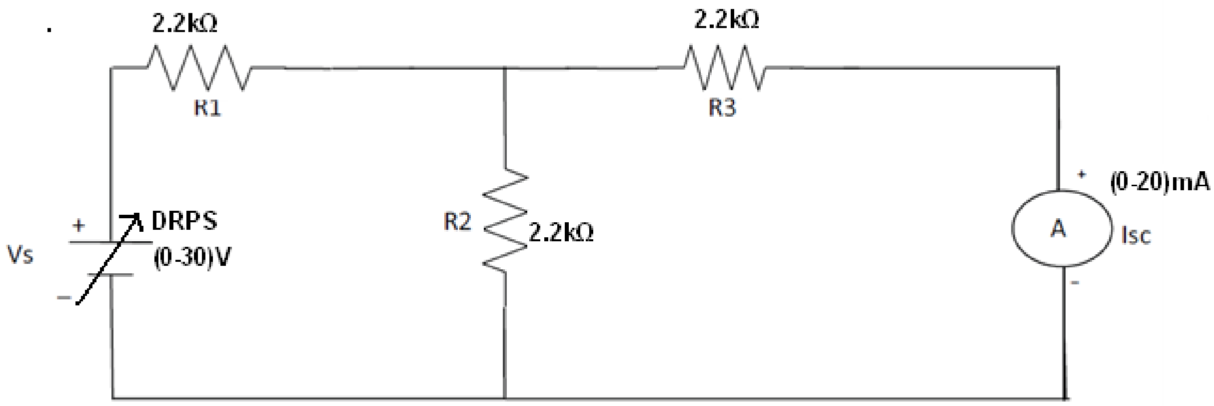


Fig (1.5a)

EQUIVALENT NORTON'S CIRCUIT

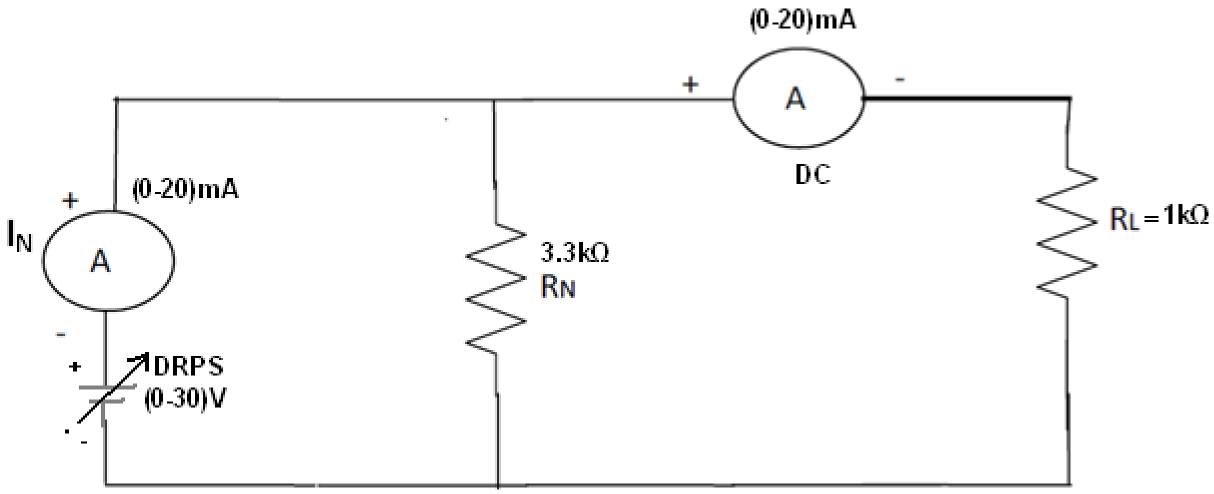


Fig (1.6a)

Tabulation for Thevenin's:

Under source voltage applied as shown in fig 1a

V_S	I_L (practical)	I_L (theoretical)

To measure V_{TH} in Fig.1.2a

V_S	V_{TH}

To measure and calculate Thevenin's voltage and current equivalent resistance in fig 1.3a

V_S (Volts)	practical		theoretical		R_{TH}
	V_{TH}	I_{TH}	V_{TH}	I_{TH}	

Tabulation for Norton's:

Under source voltage applied as shown in fig 1.4a

V_S	I_L(practical)	I_L (theoretical)

To measure V_{TH} in Fig.1.5a

V_S	I_N

To measure and calculate Norton's current equivalent resistance fig. 1.6a

V_S (Volts)	practical		theoretical	
	I_N	I_L	I_N	I_L

THEVENIN'S AND NORTON'S THEOREM

AIM: Experimental determination of Thevenin's and Norton's equivalent circuits and verifying theoretically and practically.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	DRPS	0-30V	DC	1
2.	Ammeter	0-20mA	DC	1
3.	DMM			1
4.	Resistors	2.2kΩ, 1kΩ		3,1
5.	Bread board			1
6.	Connecting wires			required

THEORY:

STATEMENT OF THEVENIN'S THEOREM:

Any two terminal linear bilateral network containing of energy sources and impedances can be replaced with an equivalent circuit consisting of voltage source Vth in series with an impedance, Zth., Where Vth is the open circuit voltage between the load terminals and Zth is the impedance measured between the terminals with all the energy sources replaced by their internal impedances.

STATEMENT OF NORTON'S THEOREM:

Any two terminal linear bilateral network containing of energy sources and impedances can be replaced with an equivalent circuit consisting of current source I_N in parallel with an admittance, Y_N.where I_N is the short circuit current through the load terminals and Y_N is the admittance measured between the terminals with all the energy sources replaced by their internal admittance.

CALCULATIONS FOR THEVENIN'S AND NORTON'S THEOREMS:-

Thevenin's theorem formulas:

Total current of the circuit I = Vs /R Amp.

I_L = {(Total current) I × [(opposite resistance) ÷ (total Resistance)]} Amp

I_{sc} = {(Total current) I × [(opposite resistance) /(total Resistance)]}Amp.

$I = V / R_{TH}$

$I_L = V_{TH} / (R_{TH} + R_L)$

$V_{TH} = IR_3$

$R_{TH} = [R_1R_3 / (R_1 + R_3)] + R_2$

Norton's theorem formulas:

$I_T = V / R_T$

$I_2 = I_{SC} = I_N$

$I_N = I_T * [R_3 / (R_2 + R_3)]$

$R_N = [R_1R_3 / (R_2 + R_3)] + R_2$

PROCEDURE:

FOR THEVENIN'S THEOREM:

1. Make the connections as shown in fig (1a).
2. Measure the voltmeter reading name it as "V_{th}".
3. Remove the voltage source and short circuit the terminals.
4. Measure the resistance terminals by using digital Multimeter name it as "R_{th}".
5. Compare V_{th}, R_{th} with theoretical values.

FOR NORTON'S THEOREM:

1. Connect the circuit as shown in fig (1.4a)
2. Measure the ammeter reading name it as I_{sc}.
3. Remove the voltage source and short circuit the terminals.
4. Measure the resistance terminals by using digital Multimeter name it as "R_{th}".
5. Compare Isc, Rth with theoretical values.

PRECAUTIONS:

1. Avoid making loose connections.

2. Readings should be taken carefully without parallax error.

3. Avoid series connection of voltmeters and parallel connection ammeters.

RESULT: Verified theoretically and practically Load current by using Thevenin's and Norton's theorems.

Experiment No 2

MAXIMUM POWER TRANSFER THEOREM

Maximum Power Transfer Theorem Circuit:-

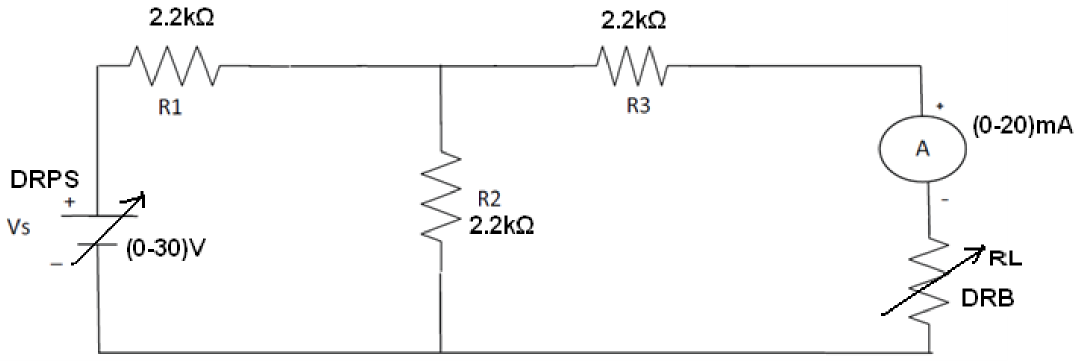


Fig (1b)

Equivalent circuit of maximum power transfer theorem:-

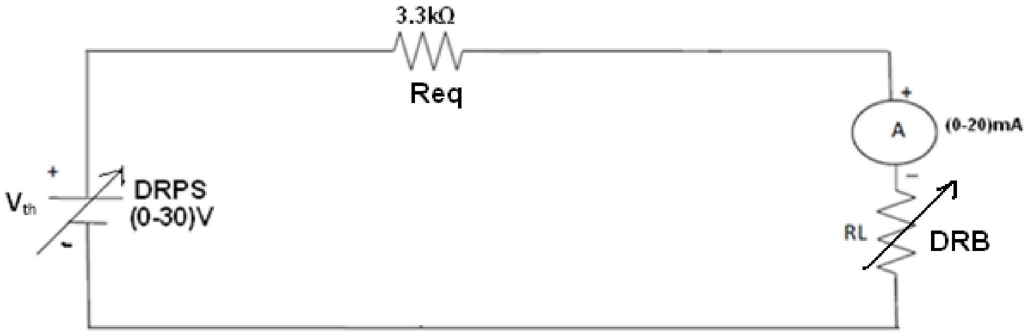


Fig (1.1b)

MAXIMUM POWER TRANSFER THEOREM

Aim: To verify maximum power transfer theorem theoretically and practically.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	DRBS	(0-30)V	DC	1
2.	DECAY RESISTANCE BOX			1
3.	BREAD BOARD			1
4.	AMMETER	(0-20)mA	DC	1
5.	RESISTORS	2.2KΩ,3.3KΩ		3,1
6.	CONNECTING WIRES			Our requirement

THEORY:

STATEMENT FOR MAXIMUM POWER TRANSFER THEOREM:

It states that the maximum power is transferred from the source to the load, when the load resistance is equal to the source resistance.

PROCEDURE:

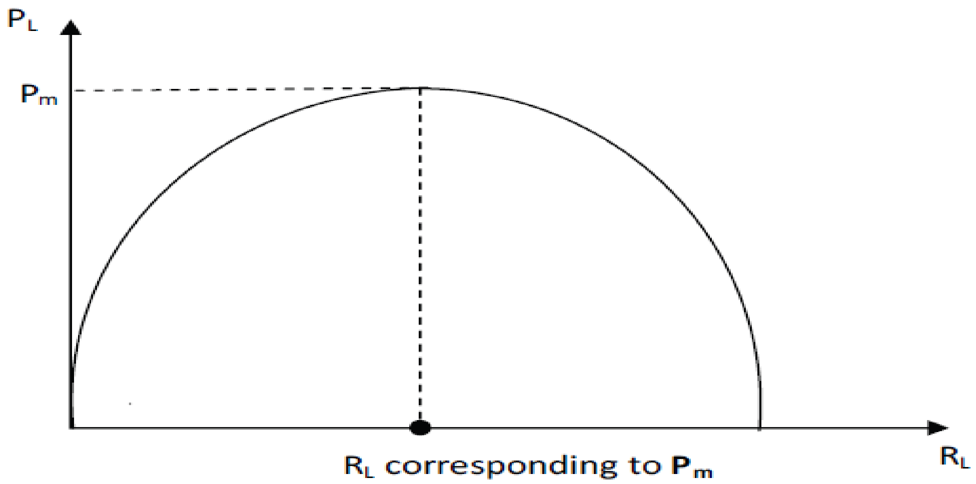
1. Make the connections as shown in fig (1b).
2. By varying RL in steps, note down the reading of ammeter I_L in each step.
3. Connect the circuit as shown in fig (1.1b), measure the effective resistance R_{th}. With the help of digital multimeter.
4. Calculate power delivered to load PL in each step.
5. Draw a graph PL Vs RL and find the RL corresponding to maximum power from it.
6. Verify that RL corresponding to maximum power from the graph is equal to the R_{th} (which is nothing but source resistance RS).

OBSERVATIONS:

Tabular column:

S.No	R_L	Theoretical values		Practical values	
		I_L	$P_L= I_L^2R_L$	I_L	$P_L= I_L^2R_L$

MODEL GRAPH



PRECAUTIONS:

1. Avoid making loose connections.
2. Readings should be taken carefully without parallax error.
3. Avoid series connection of voltmeters and parallel connection ammeters.

CALCULATIONS:

$$P_{MAX}=I^2R$$

RESULT: Verified theoretically and practically Load current by using Maximum Power Transfer Theorem

Experiment no: 3

SUPER POSITION THEOREM

SUPERPOSITION THEOREM AND RMS VALUE OF COMPLEX WAVE:-

Case1:VS1=10V, VS2=5V

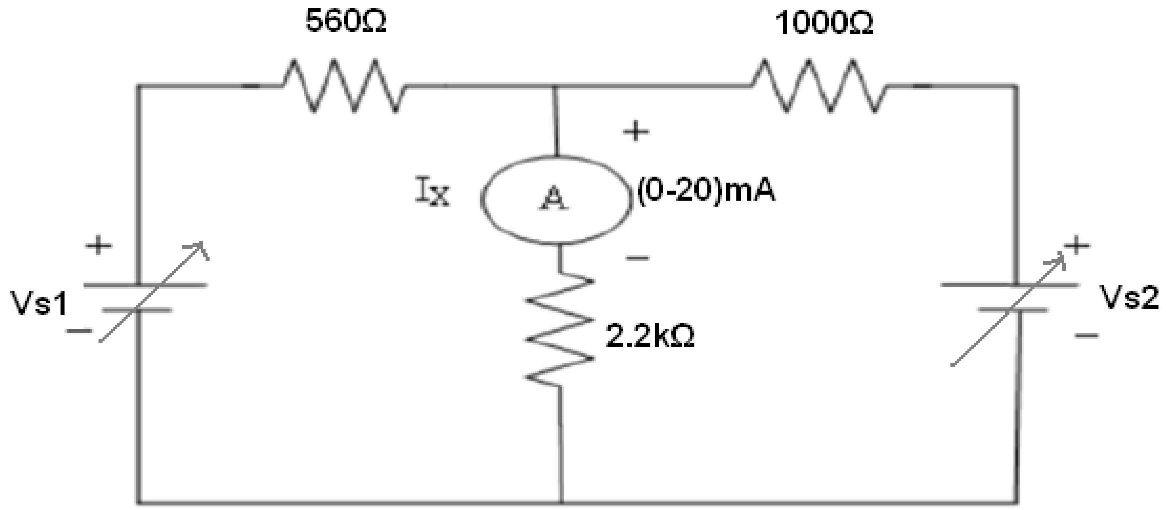


Fig (2)

Case2:-VS1=10V, VS2=0V

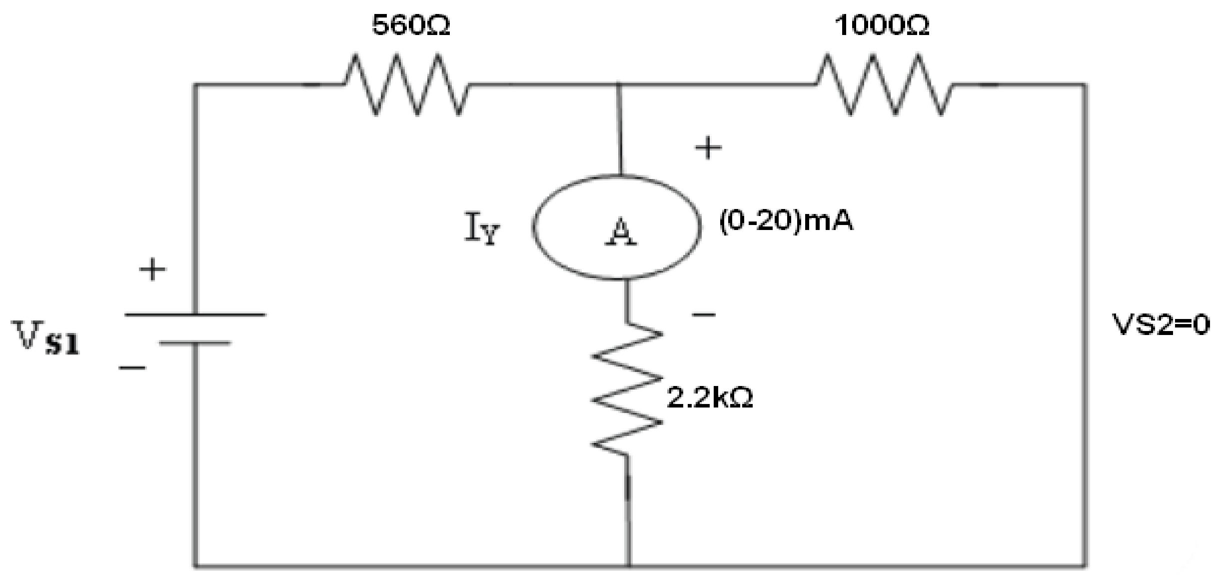


Fig (2.1)

Case3:VS1=0V, VS2=5V

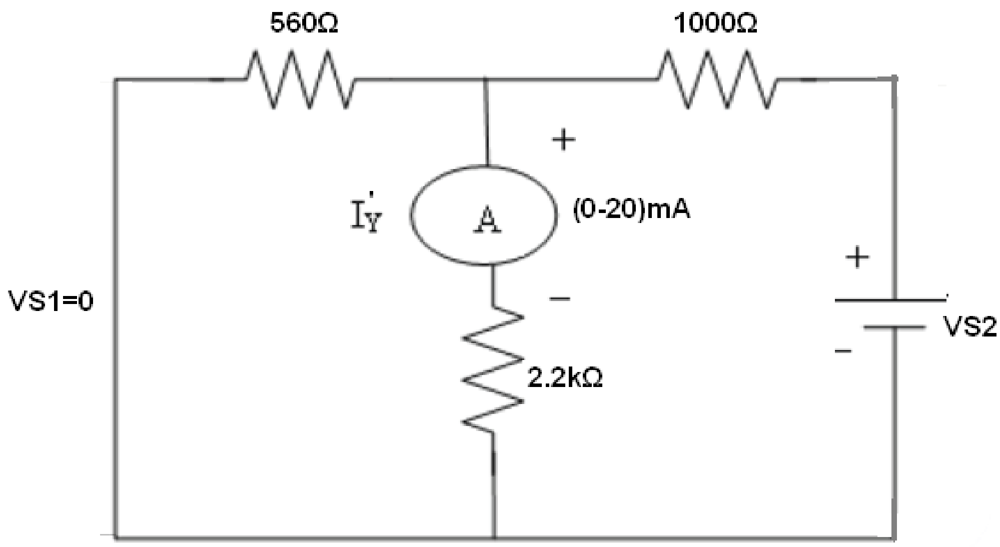


Fig (2.2)

OBSERVATIONS:

When both sources are acting fig 2

V_1	V_2	I_X (Theoretical)	I_X (Practical)

When V_1 source alone in fig 2.1

V_1	V_2	I_Y (Theoretical)	I_Y (Practical)

When V_2 source alone in fig 2.2

V_1	V_2	I'_Y (Theoretical)	I'_Y (Practical)

SUPER POSITION THEOREM

AIM: Verification of Superposition theorem and to experimentally determine the RMS value of a complex wave.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	DRPS	(0-30)V	DC	1
2.	Bread board			1
3.	Ammeter	(0-20)mA	DC	1
4.	Resistors	560Ω,1000Ω, 2.2KΩ		1,1,1
5.	Connecting wires			Required

THEORY:

SUPERPOSITION THEOREM STATEMENT

In any linear bilateral network containing two or more energy sources the response at any element is equivalent to the algebraic sum of the responses caused by the individual sources.

i.e. While considering the effect of individual sources, the other ideal voltage sources and ideal current sources in the network are replaced by short circuit and open circuit across the terminals. This theorem is valid only for linear systems.

PROCEDURE:

SUPERPOSITION THEOREM:

1. Connect the circuit as shown in fig (2)
2. Current through load resistor is noted as I_X by applying both the voltages V_1 and V_2 through RPS.
3. Make the supply voltage V_2 short circuited and apply V_1 as shown in fig (2.1) and note down the current through load resistor as I_Y.
4. Make the supply voltage V_1 short circuited and apply V_2 as shown in fig (2.2) and note down the current through load resistor as I'_Y.
5. Now verify that $I_X = I_Y + I'_Y$ theoretically and practically which proves Superposition Theorem

PRECAUTIONS:

1. Avoid making loose connections.
2. Readings should be taken carefully without parallax error.
3. Avoid series connection of voltmeters and parallel connection ammeters.

CALCULATION:

$I=V/R$

$[(V_1-V)/R_1]+V/R_2+ [(V_2-V)/R_3] =0$

$I=V/R_2$

$I_T=V_1/R_T$

$I_1=I_T*R_3/ (R_2+R_3)$

$I_T=V_2/R_T$

$I_2=I_T*R_1/ (R_1+R_2)$

RESULT: Superposition theorem is verified theoretically and practically.

Experiment no: 4

COMPENSATION THEOREM

VERIFICATION OF COMPENSATION THEOREM

AIM: To verify compensation theorem.

APPARATUS:

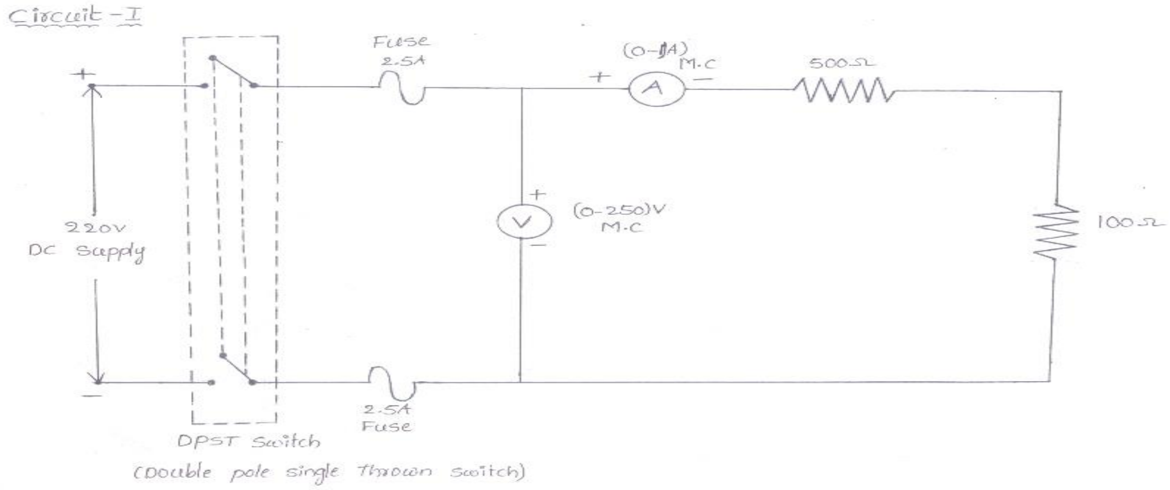
Sl.no	Name	Type	Range	Qty
1.	Voltmeter	M.C	0-300V	1
			0-50 V	1
2.	Ammeter	M.C	0-1 A	1
3.	Rheostat	Wire wound	0-500 Ω / 1.2A	1
			0-100 Ω / 3A	1
			0-50 Ω / 5A	1
4.	R.P.S	----	0-30 V / 2 A	1
5.	Connecting wires	-----	----	As required

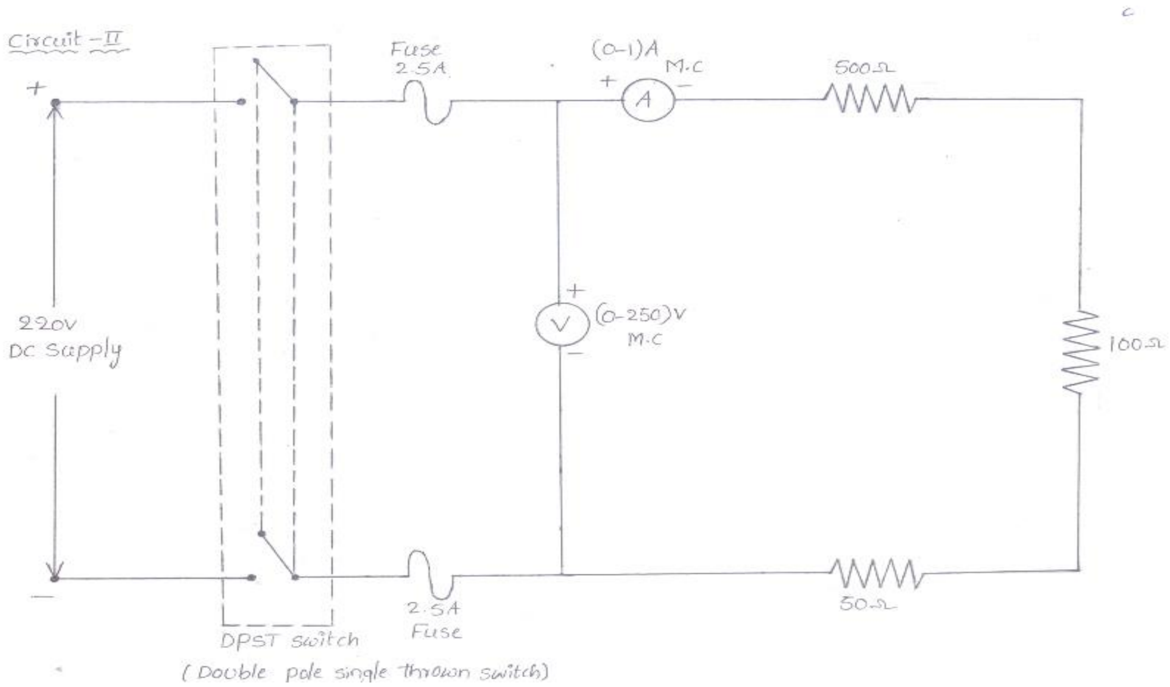
THEORY:

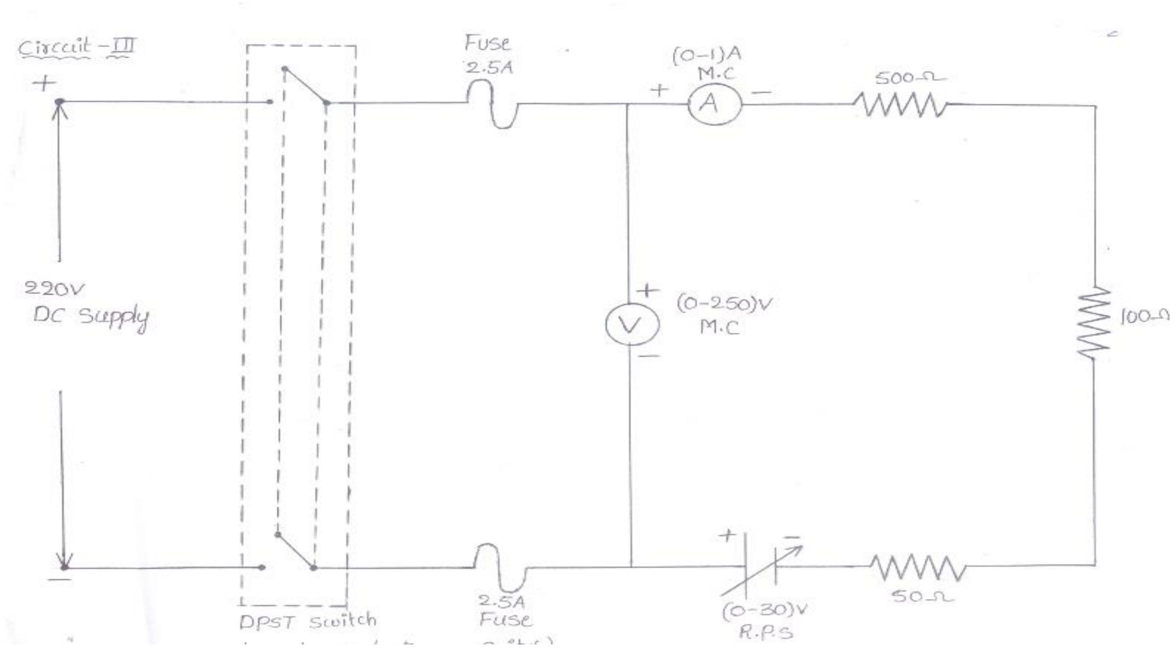
"In a linear bilateral network, if the current in a branch is I and the impedance Z in that branch is change by δZ, then the changes in the currents in all the branches of the network can be obtained as the current produced due to a voltage source of value IδZ, introduced in that branch containing δZ, in a direction opposing the current I, with all the sources in the network reduced to zero".

This theorem is useful in finding the changes in current or voltage when the value of resistance or impedance is changed in the circuit.

CIRCIUT DIAGRAM:







PROCEDURE:

1. Connect the circuit as per the circuit diagram.
2. Before modifying the circuit measure the current I in the branch.
3. Modify the branch impedance $Z_2 + \delta Z$ and measure the current I'. (This modification alters the currents and voltages existing in the network before modification)
4. Insert EMF $\delta E = I\delta Z$ in the branch and measure I''.

   Its prove that I = I''

(In order to counteract the effect of changing Z by δZ and EMF δE is increased in this branch)

PRACTICAL OBSERVATIONS:

From Circuit 1

S.no	Vin (V)	I (A)

From Circuit 2

S.no	Vin (V)	I' (A)

From Circuit 3

S.no	V1 (V)	I' (A)	IδZ (V)

RESULT: Hence the compensation theorem is verified.

Experiment no: 5

RECIPROCITY THEOREM

RECIPROCITY THEOREM:

CASE1:

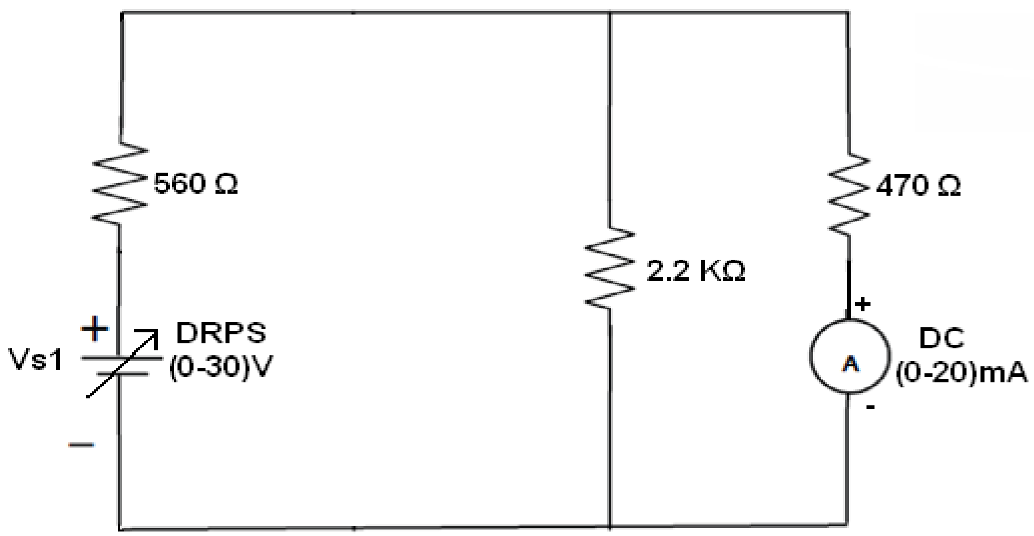


Fig (3)

CASE2:

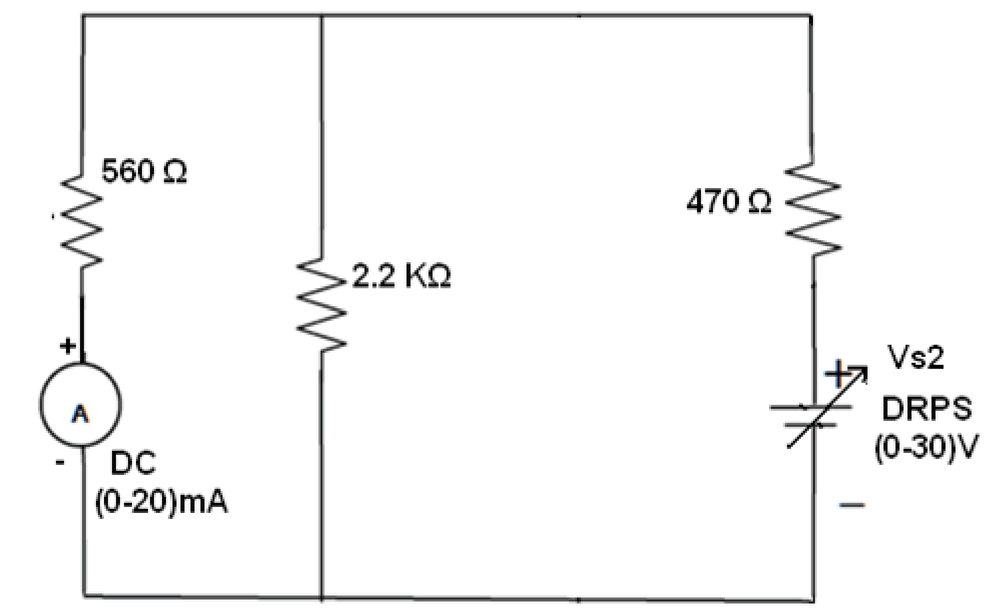


Fig (3.1)

TABULAR COLUMN OF RECIPROCITY THEOREM:-

BEFORE INTER CHANGING SOURCE:-

Vs	Theoretical values		Practical values	
	I_2	Vs/ I_2	I_2	Vs/ I_2

AFTER INTER CHANGING SOURCE

Vs	Theoretical values		Practical values	
	I_1	Vs/ I_1	I_1	Vs/ I_1

VERIFICATION OF RECIPROCITY THEOREM

Aim: - To verify Reciprocity theorem theoretically and practically.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	DRPS	0-30V	DC	1
2.	Ammeter	0-20mA	DC	1
3.	Bread board			1
4.	Resistors	560Ω,470Ω,2.2kΩ,		1,1,1
5.	Voltmeter	0-30V	DC	1
6.	Connecting wires			Required

THEORY:-

Reciprocity theorem:- In a linear bilateral single source network if voltage at any point in the network produces a current at same other point in the network , the same voltage at other point produces same current at the first point in that net work.

PROCEDURE:-

Reciprocity theorem:-

1. Connect the circuit as shown in fig (3)
2. From fig (3) of Superposition theorem note down $I_2=I_Y$.
3. Now interchange the source and ammeter as in fig (3.1).
4. Note down the ammeter reading as I_1.
5. Now verify that $Vs/\ I_1 = Vs/\ I_2$ theoretically and practically which proves reciprocity theorem..

CALCULATIONS:

Reciprocity theorem:

V=IR

RESULT: - Verified Reciprocity theorem theoretically and practically.

Experiment no: 6

SERIES AND PARALLEL RESONANCE

SERIES AND PARALLEL RESONANCE:

CIRCUIT DIAGRAM OF SERIES RESONANCE:-

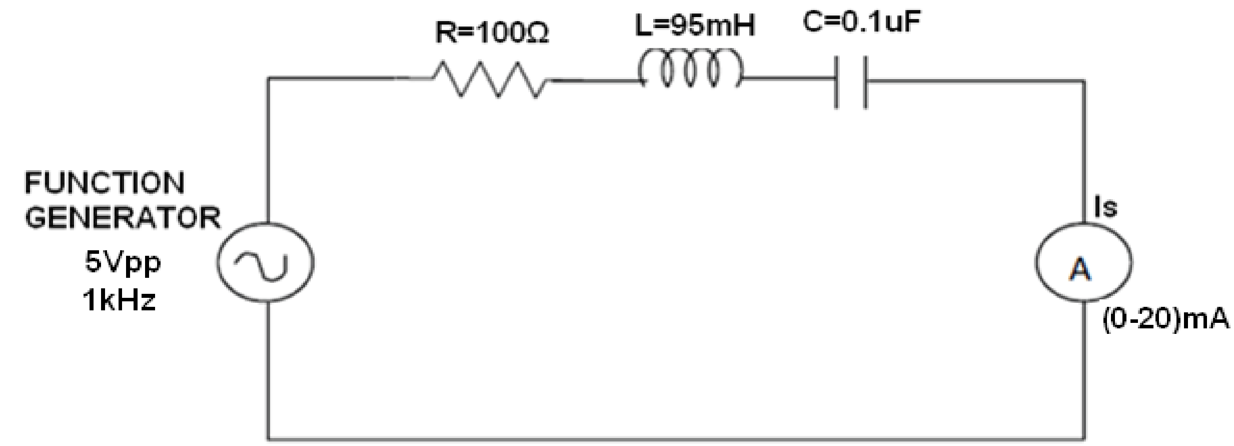


Fig (4)

PARALLEL RESONANCE:-

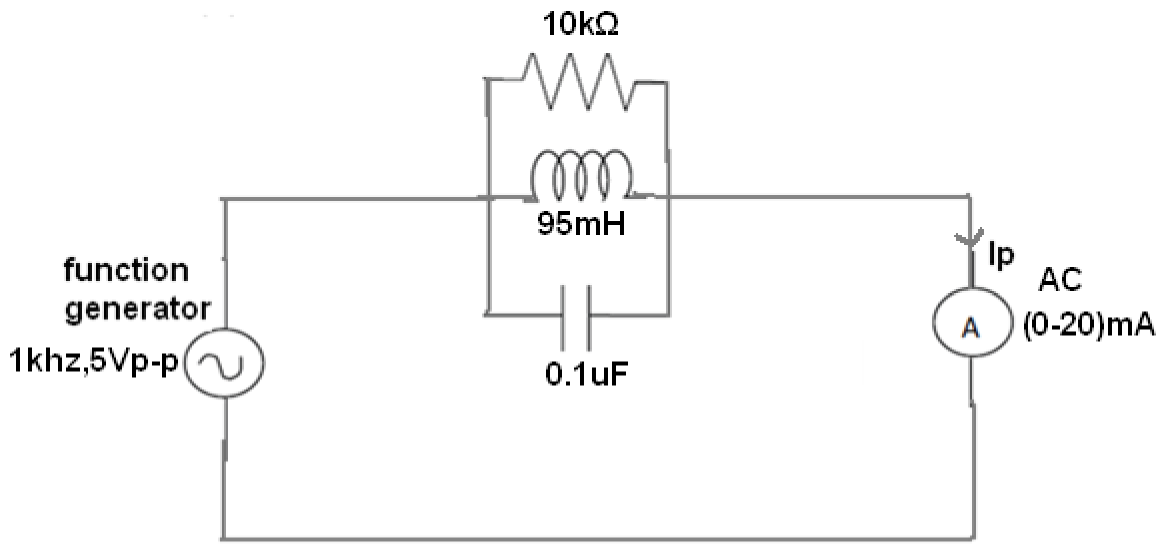
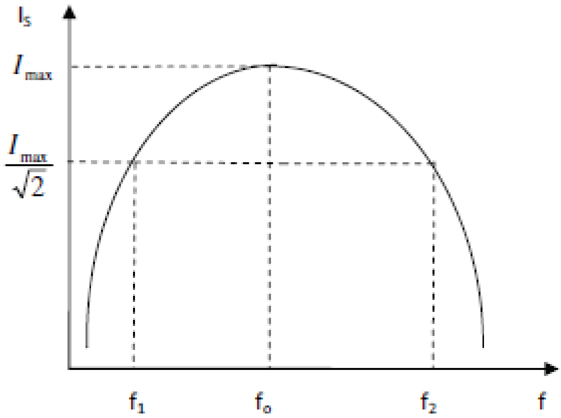


Fig 4.1

MODEL GRAPH: Series Resonance

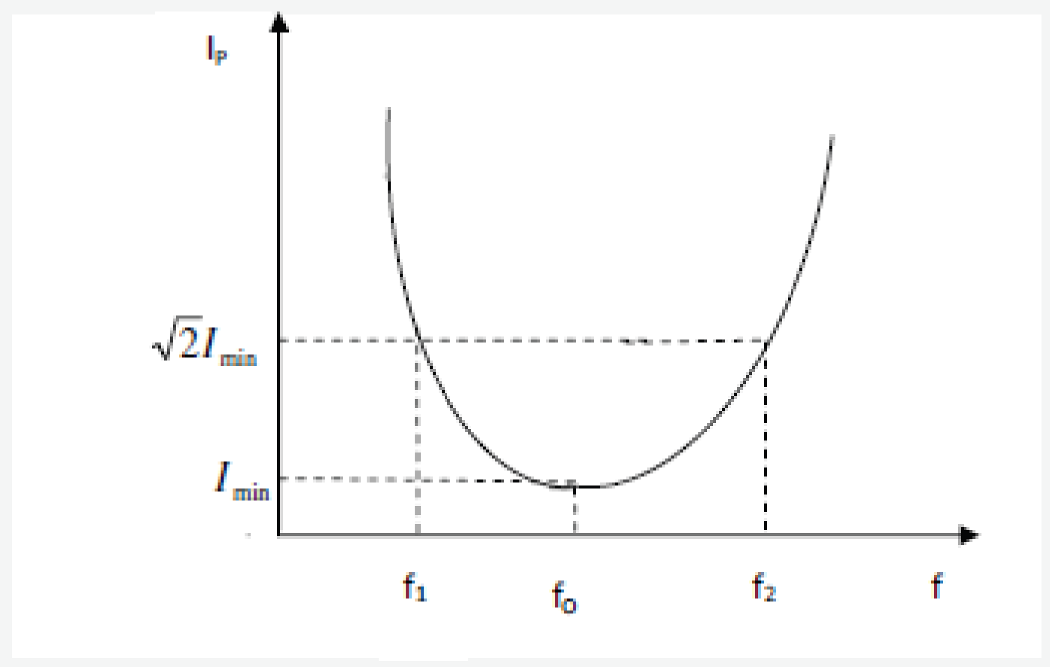


OBSERVATIONS:

SERIES RESONANCE

S.No.	*Frequency (f)*	Current(Is)

MODEL GRAPH: Parallel resonance



OBSERVATIONS Parallel resonance:

S.No.	*Frequency (f)*	Current(Is)

SERIES AND PARALLEL RESONANCE

AIM: To verify resonant frequency, bandwidth & quality factor of RLC series and parallel Resonant circuits.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	Function generator	$5V_{PP}$, 1KHZ	AC	1
2.	Decade Capacitance box			1
3.	Decade Resistance box			1
4.	Decade Inductance box			1
5.	Ammeter	0-20mA		1
6.	Connecting wires			required

THEORY:

In a series RLC circuit. The current lags behind or leads the applied voltage depending upon the values of XL and Xc. XL causes the total current to lag behind the applied voltage while Xc causes the total current to lead the applied voltage. When XL > Xc the circuit is predominantly inductive, and when XL < Xc the circuit is predominantly capacitive. In the series RLC circuit resonance may be produced by varying the frequency keeping L and C constant. Otherwise resonance may be produced by varying either L or C for fixed frequency .Parallel resonance occurs when XL = Xc. when XL = Xc the two branch currents are equal in magnitude and 180 deg out of phase with each other .Hence two currents cancel each other and net current is zero.

PROCEDURE:

SERIES RESONANCE:

1. Connect the circuit as shown in the fig (4)
2. Apply a fixed voltage through function generator to the circuit.
3. The frequency of the signal is varied in steps and note down corresponding ammeter reading as Is. observe that current is maximum at resonant frequency.
4. Draw a graph between frequency f and current Is .Mark Resonant frequency and Current at half power frequencies.

$$Q = \frac{f_0}{f_2 - f_1}$$

5. Find Bandwidth = (f2-f1.) & Quality factor from graph.
6. Compare practical values of resonant frequency, Q-factor and Bandwidth with theoretical values.

PARALLEL RESONANCE:

1. Connect the circuit as shown in the fig (4.1)
2. Apply a fixed voltage through function generator to the circuit.
3. The frequency of the signal is varied in steps and note down corresponding ammeter reading as Is. Observe that current is minimum at resonant frequency.
4. Draw a graph between frequency f and current Is .Mark resonant frequency and current at half power frequencies.
5. Find Bandwidth = (f2-f1.) & Quality factor from graph.

$$Q = \frac{f_0}{f_2 - f_1}$$

6. Compare practical values of resonant frequency, Q-factor and Bandwidth with theoretical values.

PRECAUTIONS:

1. Avoid making loose connections.
2. Readings should be taken carefully without parallax error.
3. Avoid series connection of voltmeters and parallel connection ammeters.

RESULT: Resonant frequency, Bandwidth and Quality factor of R L C Series and parallel resonant circuits are calculated.

Experiment no: 7

Z and Y PARAMETERS

Z AND Y PARAMETERS:-

CIRCUIT FOR Z & Y PARAMETERS:

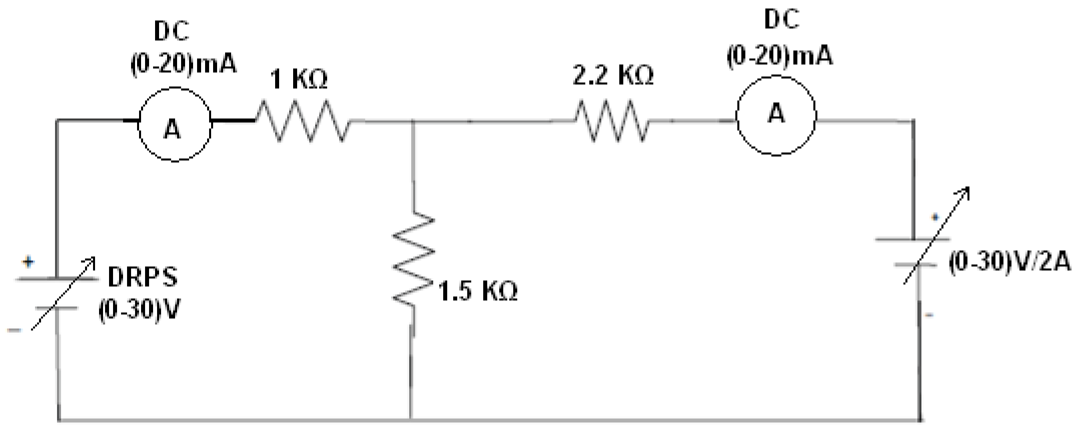


Fig: 5

CALCULATION FOR Z_{11} & Z_{21}:

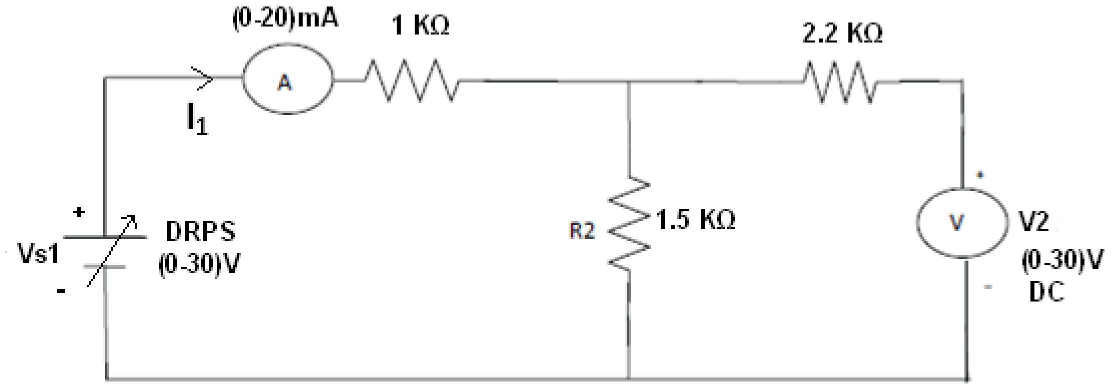


Fig: 5.1

CALCULATION FOR Z_{22} & Z_{12}:

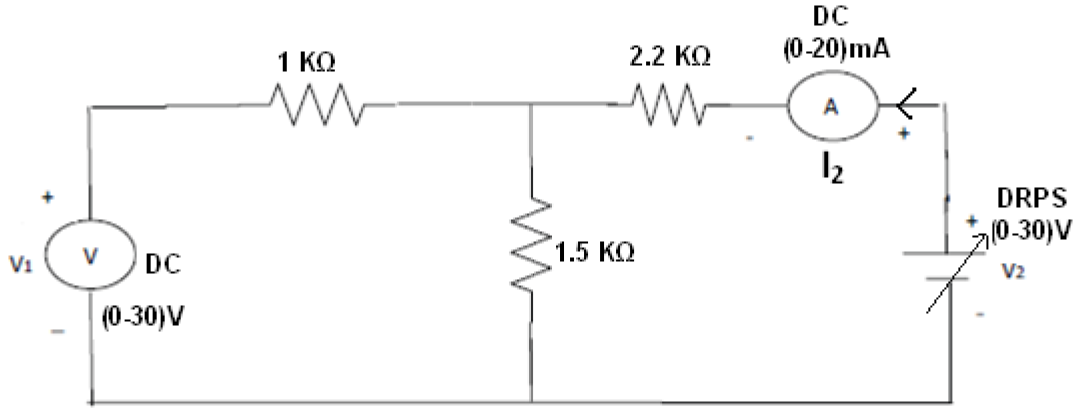


Fig 5.2

CALCULATION FOR Y_{11} & Y_{21}:

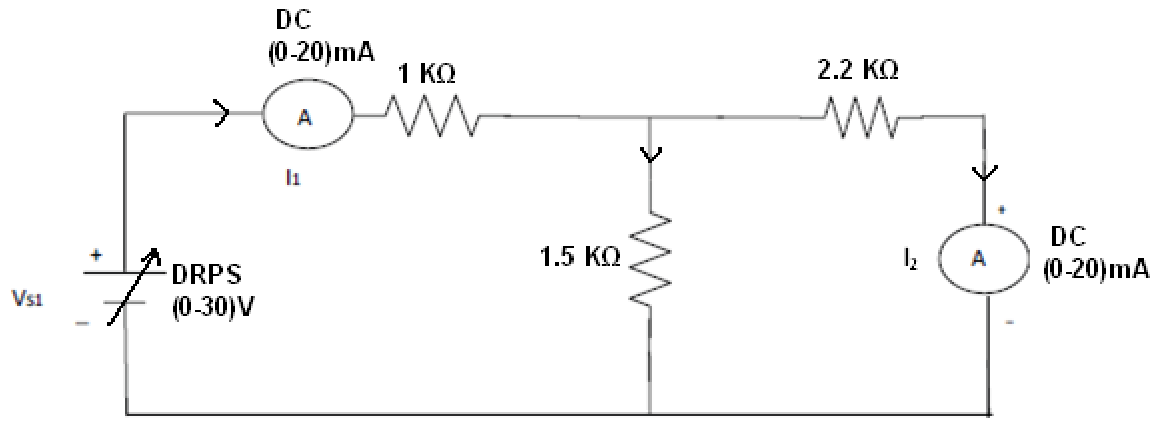


Fig: 5.3

CALCULATION FOR Y_{12} & Y_{22}:

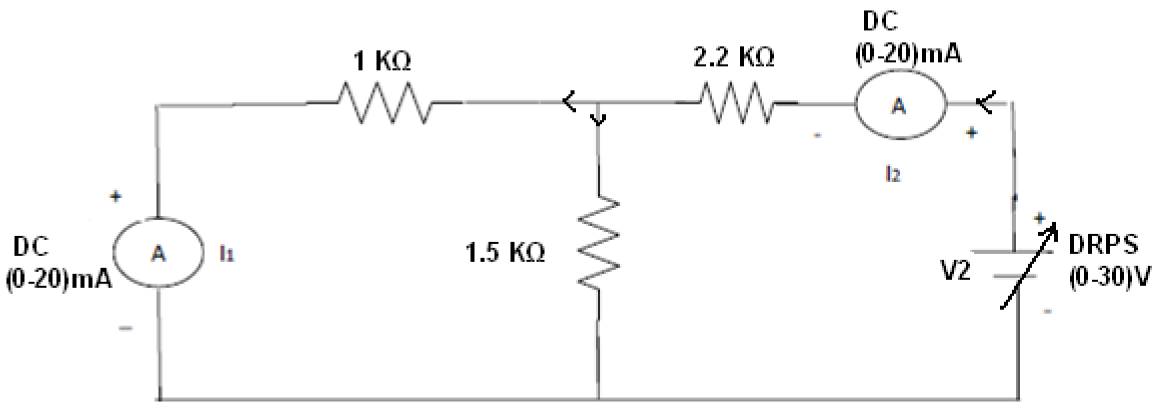


Fig 5.4

OBSERVATIONS:

When $I_1=0$

S.NO	V_1	$\mathbf{I_2}$	$\mathbf{V_2}$

When $I_2=0$

S.NO	V_1	$\mathbf{I_1}$	$\mathbf{V_2}$

When $V_1=0$

S.NO	I_2	I_1	V_2

When $V_2=0$

S.NO	V_1	I_1	I_2

RESULT TABLE:

	Z Parameters				Y Parameters			
	Z_{11}	Z_{12}	Z_{21}	Z_{22}	Y_{11}	Y_{12}	Y_{21}	Y_{22}
Theoretical								
Practical								

Z and Y PARAMETERS

AIM: To obtain experimentally Z parameters and Y parameters of a given two port network.

APPARATUS REQURIED:

S NO	Name of the Equipment	Range	Type	Quantity
1.	DRPS	0-30V		1
2.	Ammeter	0-20mA	DC	2
3.	Voltmeter	0-30V	DC	1
4.	Resistors	1KΩ, 1.5KΩ, 2.2KΩ		1 1 1
5.	Bread board			1
6.	Connecting wires			Our requirement

THEORY:

A network is having two pairs of accessible terminals, it is called a two port network. If voltage and current at the input and output terminals are V1 , I1 and V2 , I2 respectively, there are six sets of possible combinations generated by the four variables, describing a two – port network. Z - parameters and Y- parameters are two among them.

Using Z- parameters the circuit can be represented by the following equations

$V1 = Z11\ I1 + Z12\ I2$

$V2 = Z21\ I1 + Z22\ I2$

Using Y- parameters the circuit can be represented by the following equations

$I1 = Y11\ V1 + Y12\ V2$

$I2 = Y21\ V1 + Y22\ V2$

PROCEDURE:

1. Open Circuiting Output Terminals (I2 = 0):

Connections are made as per the circuit diagram shown in fig (5). Output terminals are kept Open via a voltmeter. Supply is given to input port. Note the readings of ammeter as I1 and Voltmeter as V2.

2. Short circuiting output terminals (V2 = 0): Connections are made as per the circuit diagram shown in fig (5.3). Output terminals are short circuited via an ammeter. Supply is given to input port. Note the readings of ammeters as I1 and I2.

3. Open circuiting input terminals (I1 = 0): Connections are made as per the circuit diagram shown in fig (5.2). Input terminals are kept open via an voltmeter. Supply is given to output terminals. Note the readings of ammeter as I2 and voltmeter as V1.

4. Short circuiting input terminals (V1=0): Connections are made as per the circuit diagram shown in fig (5.4). Input terminals are short circuited via an ammeter. Supply is given to output port. Note the readings of ammeters as I1 and I2.

5. Calculate Z, Y Parameters values

PRECAUTIONS:

1. Avoid making loose connections.
2. Readings should be taken carefully without parallax error.
3. Avoid series connection of voltmeters and parallel connection ammeters.

CALCULATIONS:

Theoretical formulas:

$\mathbf{V_1= Z_{11}I_1+Z_{12}I_2}$

$\mathbf{V_2=Z_{21}I_1+Z_{22}I_2}$

When $I_1=0$

$$Z_{12}=V_1/I_2$$

$$Z_{22}=V_2/I_2$$

When $I_2=0$

$$Z_{11}=V_1/I_1$$

$$Z_{21}=V_2/I_1$$

$I_1 = Y_{11}V_1 + Y_{12}V_2$

$I_2 = Y_{21}V_1 + Y_{22}V_2$

When $V_2=0$

$$Y_{11} = I_1 / V_1$$

$$Y_{21} = I_2/V_1$$

When $V_1=0$

$$Y_{12}=I_1/V_2$$

$$Y_{22}=I_2/V_2$$

RESULT: Experimentally Determined Z and Y Parameters of Two Port Networks.

Experiment no: 8

Transmission & Hybrid Parameters

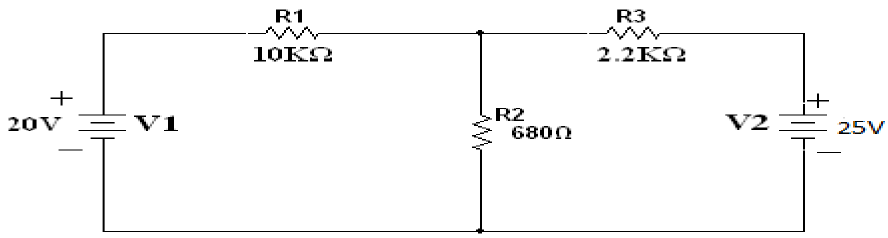
AIM: To determine the ABCD (T) and Hybrid (H) parameters of a two port network.

APPARATUS REQUIRED:

S.No	Name Of The Equipment	Range	Type	Quantity
1	Voltmeter	(0-20)V	Digital	1 NO
2	Ammeter	(0-20)mA	Digital	1 NO
3	RPS	0-30V	Digital	1 NO
4	Resistors	10K Ω		1 NO
		2.2Ω		1 NO
		680 Ω		1 NO
5	Breadboard	-	-	1 NO
6	Connecting wires			Required number

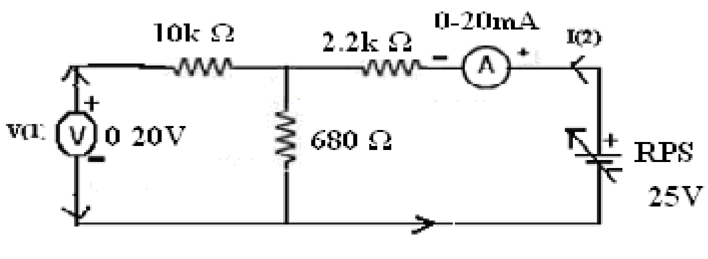
CIRCUIT DIAGRAMS:

GIVEN CIRCUIT:

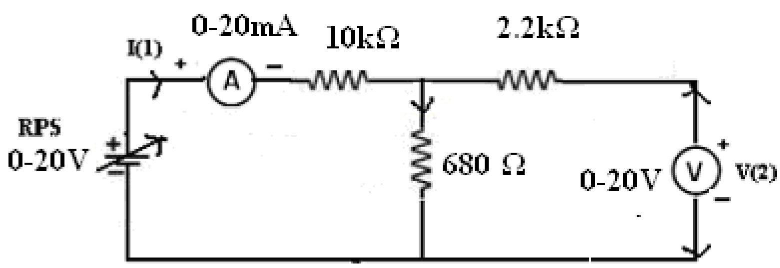


PRACTICAL CIRCUITS:

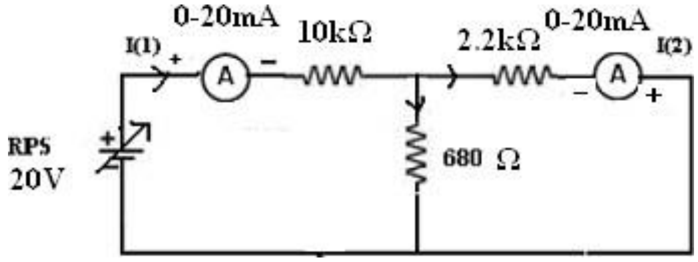
1. When $I_1 = 0$:



2. When $I_2 = 0$:



3. When $V_2 = 0$:



THEORY:

The relation between the voltages and currents of a two port network in terms of ABCD and h–parameters is given as follows.

ABCD PARAMETERS:

$V_1 = AV_2 - BI_2$

$I_1 = CV_2 - DI_2$

$A = V1 / V2$ when I2 =0

B = -V1 / I2 when V2=0

C = I1 / V2 when I2=0

D = -I1 /I2 when V2 = 0

H-PARAMETERS

V1=h11I1+h12V2

I2=h11I1+h22V2

$$h_{11} \stackrel{\text{def}}{=} \left.\frac{V_1}{I_1}\right|_{V_2=0} \qquad h_{12} \stackrel{\text{def}}{=} \left.\frac{V_1}{V_2}\right|_{I_1=0}$$

$$h_{21} \stackrel{\text{def}}{=} \left.\frac{I_2}{I_1}\right|_{V_2=0} \qquad h_{22} \stackrel{\text{def}}{=} \left.\frac{I_2}{V_2}\right|_{I_1=0}$$

PROCEDURE:

1. Connections are made as per the circuit diagram.
2. Open circuit the port – 1 i.e., $I_1=0$ find the values ofV_1, I2 and V_2.
3. Short circuit the port-1 V_1 =0 find the values of V_2, $I_1$and I_2.
4. Open circuit the port – 2 i.e., $I_2=0$ find the values of V_1, I1 and V_2.
5. Short circuit the port-2 i.e. V_2 =0 find the values of V_1, $I_1$and I_2
6. Find the ABCD and h-parameters of the given two port network from the above data.

THEORITICAL VALUES:

$V_2 = 0$	V1=	I1=	I2=
$I_1 = 0$	V1=	V2=	I2=
$I_2 = 0$	V1=	V2=	I1=

PRACTICAL VALUES:

$V_2 = 0$	V1=	I1=	I2=
$I_1 = 0$	V1=	V2=	I2=
$I_2 = 0$	V1=	V2=	I1=

ABCD Parameters:

T-parameters	Theoretical	Practical
A		
B		
C		
D		

h-Parameters

h-Parameters	Theoretical	Practical
$h11$		
$h12$		
$h21$		
$h22$		

PRECAUTIONS:

1. Initially keep the RP S output voltage knob in zero volt position.
2. Avoid loose connections.
3. Do not short-circuit the RPS output terminals.

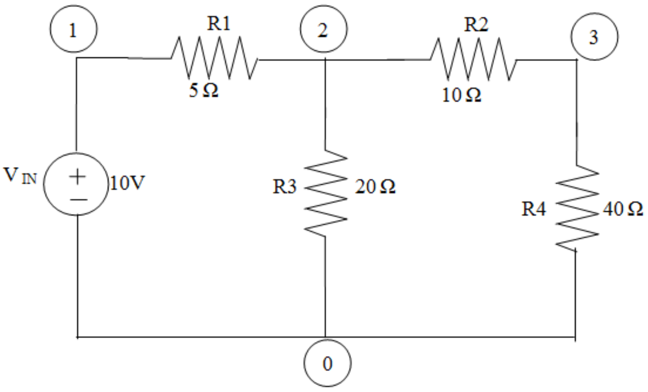
RESULT: Hence ABCD (T) and Hybrid (H) parameters of a two port network is determined.

Experiment no: 9

Mesh analysis of DC Circuit using PSpice

Mesh analysis of DC Circuit using PSpice

CIRCUIT DIAGRAM



*** Program for Transfer Function Analysis**

```
VIN   1    0    DC    10V        ; Voltage Source of 10V DC
R1    1    2    5                ; 5 OHMS resistance between nodes 1 & 2
R2    2    3    10
R3    2    0    20
R4    3    0    40
.OP
.END                             ; End of the Program
```

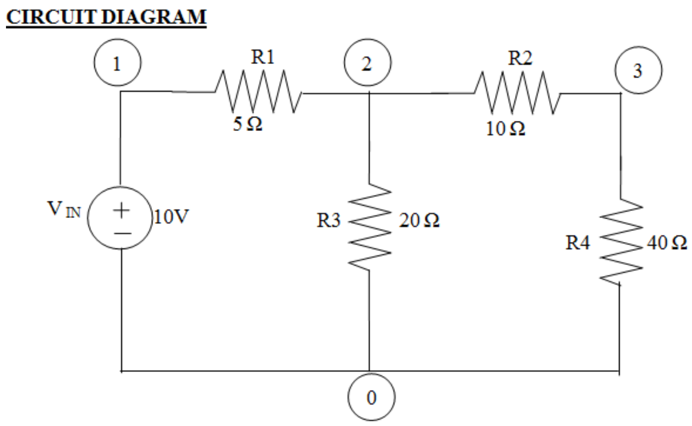
RESULT ANALYSIS

```
***************** PSpice Lite (Mar 2000) *****************

 *    CIRCUIT DESCRIPTION

***************************************************************

VIN       1     0     DC     10V

R1        1     2            5

R2        2     3            10

R3        2     0            20

R4        3     0            40

.OP

.END

*************** PSpice Lite (Mar 2000) *****************

* SMALL SIGNAL BIAS SOLUTION       TEMPERATURE =   27.000 DEG C

*********************************************************************

 NODE   VOLTAGE     NODE   VOLTAGE     NODE   VOLTAGE

(    1)   10.0000  (    2)    7.4074  (    3)    5.9259

   VOLTAGE SOURCE CURRENTS

    NAME        CURRENT

    VIN        -5.185E-01

    TOTAL POWER DISSIPATION   5.19E+00  WATTS

          JOB CONCLUDED

          TOTAL JOB TIME           .86
```

Experiment no: 10

Nodal analysis of DC Circuit using PSpice

Nodal analysis of DC Circuit using PSpice:



Program for Transfer Function Analysis

```
VIN   1   0   DC   10V        ; Voltage Source of 10V DC
R1    1   2   5               ; 5 OHMS resistance between nodes 1 & 2
R2    2   3   10
R3    2   0   20
R4    3   0   40
.OP
.END                          ; End of the Program
```

RESULT ANALYSIS

```
***************** PSpice Lite (Mar 2000) *****************

 *    CIRCUIT DESCRIPTION

****************************************************************

VIN        1      0     DC     10V

R1         1      2            5

R2         2      3            10

R3         2      0            20

R4         3      0            40

.OP

.END

*************** PSpice Lite (Mar 2000) *****************

* SMALL SIGNAL BIAS SOLUTION      TEMPERATURE =   27.000 DEG C

**********************************************************************

 NODE   VOLTAGE     NODE   VOLTAGE     NODE   VOLTAGE

(    1)   10.0000  (    2)    7.4074  (    3)    5.9259

   VOLTAGE SOURCE CURRENTS

    NAME        CURRENT

    VIN        -5.185E-01

    TOTAL POWER DISSIPATION   5.19E+00  WATTS

          JOB CONCLUDED

          TOTAL JOB TIME           .86
```

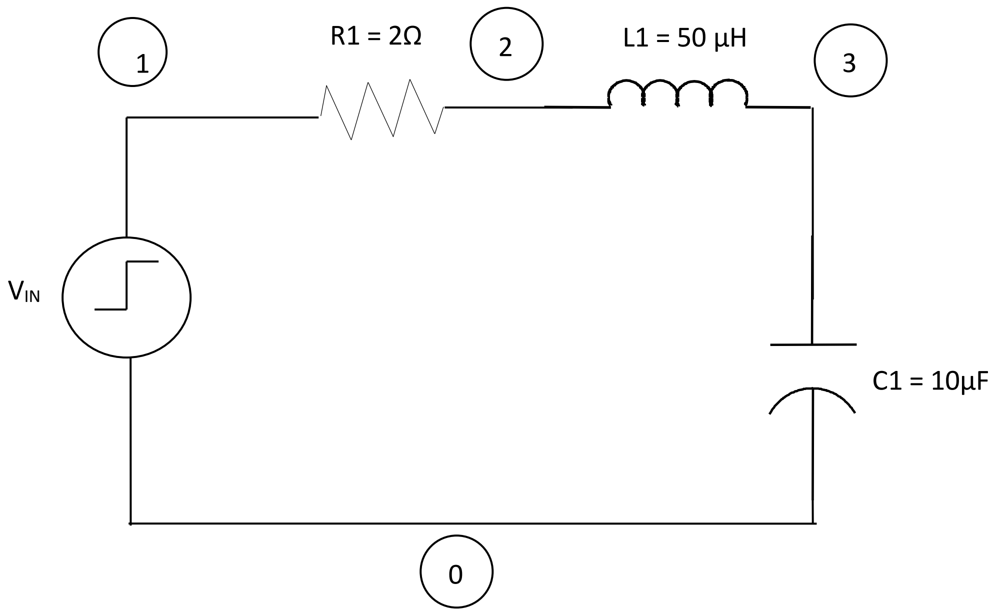
EXPERIMENT-11

DC Transient response using PSpice Simulation

DC Transient response using PSpice Simulation

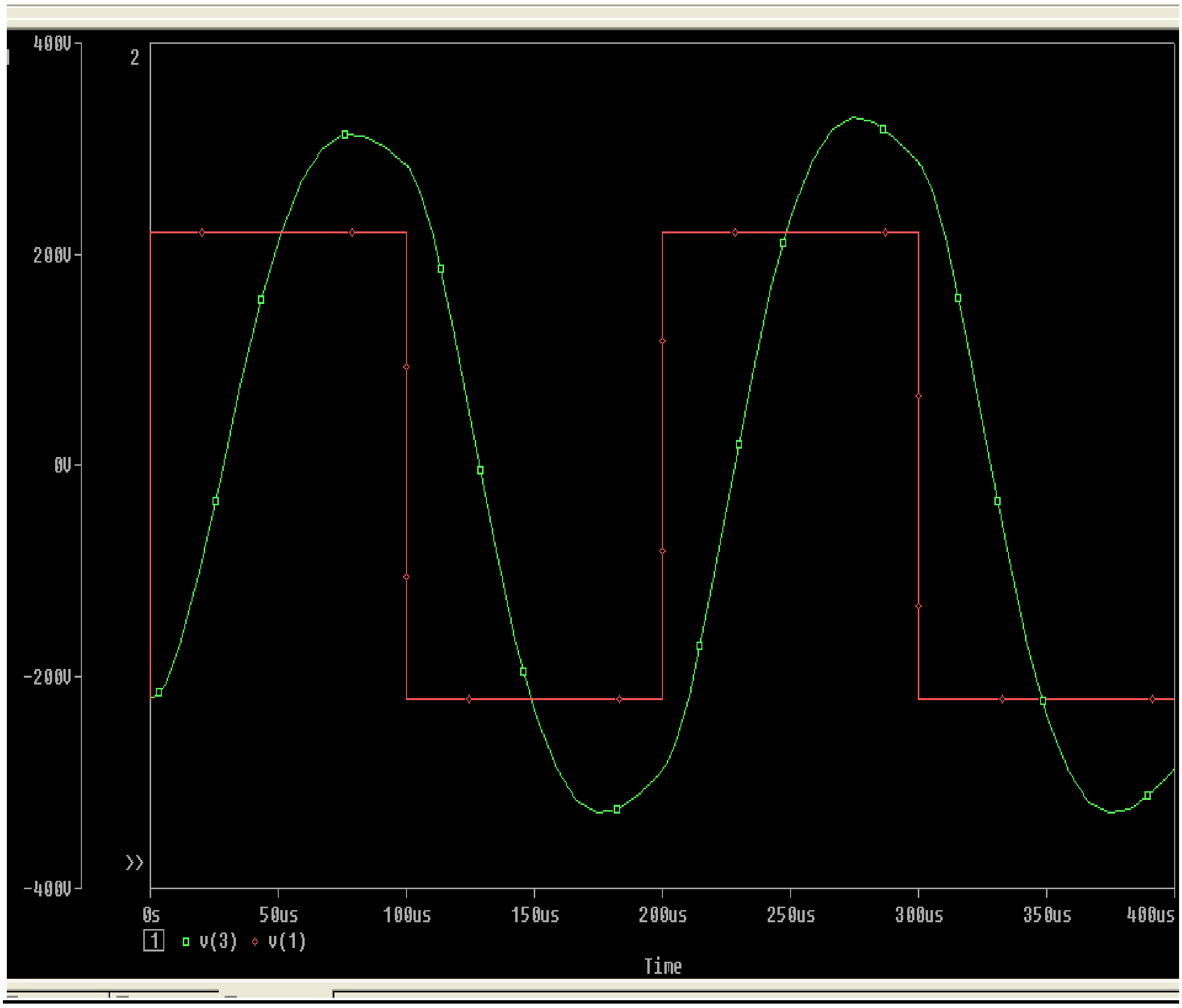
AIM: - PSpice simulation of Transient response of RLC circuit for Pulse input

CIRCUIT DIAGRAM



```
*  PULSE (-VS  +VS  TD  TR  TF  PW  PER)  ; Pulse input
* TD = Delay Time, TR = Rise Time, TF = Fall Time, PW = Pulse Width, PER = Periodicity
VIN  1  0  PULSE (-220V  220V  0  1NS  1NS  100US  200US)
R1    1     2     2
L1    2     3     50UH
C1    3     0     10UF
* .TRAN  TSTEP  TSTOP            ; Command for transient analysis
.TRAN     1US     400US
*.PRINT  TRAN  V(R1)  V(L1)  V(C1) : Prints on the output file
.PROBE                          ; Graphical waveform analyzer
.END                          ; End of circuit
```

OUTPUT



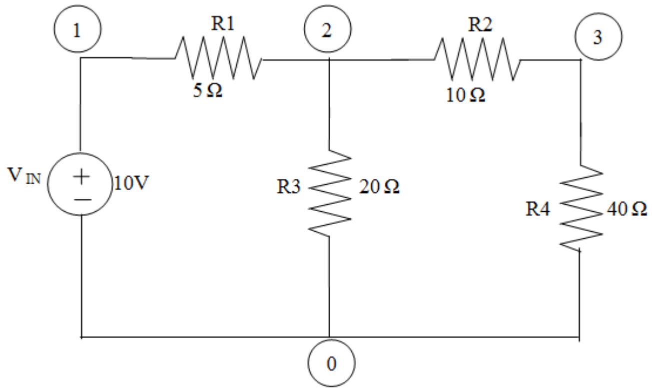
400V
200V
0V
-200V
-400V
2
>>
0s
50us
100us
150us
200us
250us
300us
350us
400us
1
v(3)
v(1)
Time

EXPERIMENT-12

LOAD CURRENT AND VOLTAGE DETERMINATION BY SIMULATION

Analysis of DC Circuit using PSpice:

CIRCUIT DIAGRAM



Program for Transfer Function Analysis

```
VIN    1     0     DC    10V          ; Voltage Source of 10V DC
R1     1     2     5                  ; 5 OHMS resistance between nodes 1 & 2
R2     2     3     10
R3     2     0     20
R4     3     0     40
.OP
.END                                  ; End of the Program
```

RESULT ANALYSIS

```
***************** PSpice Lite (Mar 2000) *****************

 *    CIRCUIT DESCRIPTION

***************************************************************

VIN       1     0     DC     10V

R1        1     2            5

R2        2     3            10

R3        2     0            20

R4        3     0            40

.OP

.END

*************** PSpice Lite (Mar 2000) *****************

* SMALL SIGNAL BIAS SOLUTION      TEMPERATURE =   27.000 DEG C

*********************************************************************

 NODE   VOLTAGE     NODE   VOLTAGE     NODE   VOLTAGE

(    1)   10.0000  (    2)    7.4074  (    3)    5.9259

   VOLTAGE SOURCE CURRENTS

    NAME        CURRENT

    VIN        -5.185E-01

    TOTAL POWER DISSIPATION   5.19E+00  WATTS

          JOB CONCLUDED

          TOTAL JOB TIME            .86
```