BRAC UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
COURSE NO.: CSE250
Circuits and Electronics Laboratory

EXPT. NO. 3

Name Of The Experiment:

Verification of Superposition Principle

OBJECTIVE:

To verify experimentally the Superposition theorem which is an analytical technique of determining currents in a circuit with more than one emf source.

THEOREM:

In a linear circuit containing multiple independent sources and linear elements (e.g. resistors, inductors, capacitors) the voltage across (or the current through) any element when all the sources are acting simultaneously may be obtained by adding algebraically all the individual voltages (or the currents) caused by each independent source acting alone, with all other sources deactivated.

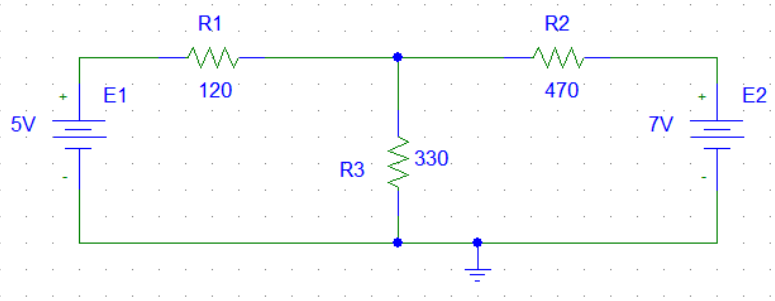
An independent voltage source is deactivated (made zero) by shorting it and an independent current source is deactivated (made zero) by open circuiting it. However, if a dependent source is present it must remain active during the superposition process.

APPARATUS :

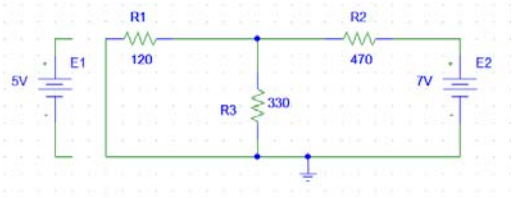
- Two DC power supplies.
- One multimeter.

PROCEDURES :

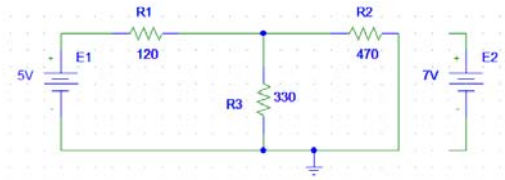
1) Set up the circuit as in Fig. 1.



When E2 active:



When E1 active:



2) Apply 5 volts from E_1 and 7 volts from E_2.
3) Measure the current I and record it in the given table.
4) Render E_2 inactive (keeping E_1 active) & measure the current $I^{/}$ in the branch R_3.
5) Render E_1 inactive (keeping E_2 active) & Measure the current $I^{//}$ in the branch R_3.
6) Verify if $I= I^{/} + I^{//}$ which would validate the superposition theorem for this particular circuit.

TABLE:

No. of Obs.	R_1 (ohms)	R_2 (ohms)	R_3 (ohms)	I_2 with both E_1 and E_2 active (amps)	$I_2^{/}$ with only E_1 active (amps)	$I_2^{//}$ with only E_2 active (amps)	$I_2^{/} + I_2^{//}$
1.	100Ω	220Ω	470Ω				
2.	1.2KΩ	2.2KΩ	3.3KΩ				

REPORT :

1. Show results in tabular form.
2. Comment on the obtained results and discrepancies (if any).

CAUTIONS:

1. **Don't switch on the supply until the circuit has been checked by your teacher.**
2. **Take care of the reading of the apparatus.**
3. **Take care of any bare circuit element in energized condition.**

QUESTION:

1. Define linear element, nonlinear element, linear circuit & nonlinear circuit.
2. "Although Superposition Principle can be used to determine voltage and current in a linear circuit, it cannot be used to determine power." --- Elucidate the statement.
3. Why an independent voltage source is deactivated by short circuiting it and an independent current source is deactivated by open circuiting it?
4. Find analytically the current I using
   - Superposition Principle
   - Mesh Current Method
   - Node Voltage Method

   for E_1 = 5 volts, E_2 = 7 volts and R_1 , R_2 , R_3 at their values recorded in the observation of the Table shown.