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SIMULATION OF DC NETWORK THEORMS USING ADVANCED SIMULATION SOFTWARE LT SPICE AND COMPARING THE BOTH RESULTS CALCULATED MANUALLY AND BY SOFTWARE.

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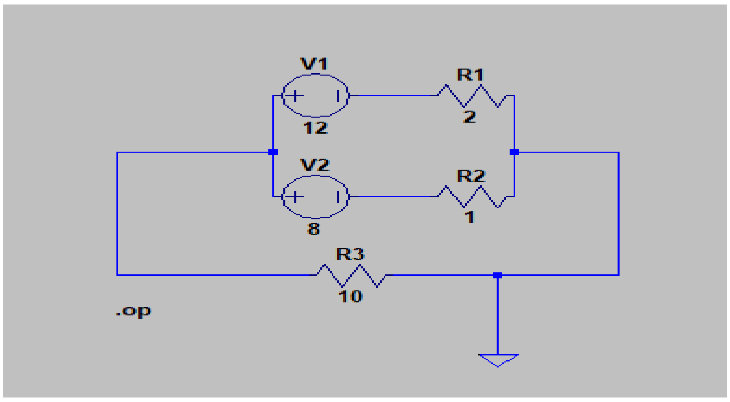
ABSTRACT
In this paper we compare the results of standard d.c theorms application on different circuits and compare their results with simulation solution using iteration method . The simulated results shows the result values calculated by these theorems and also as calculated manually and results are compared. So this research paper compares the results calculated both ways and deviations are observed.

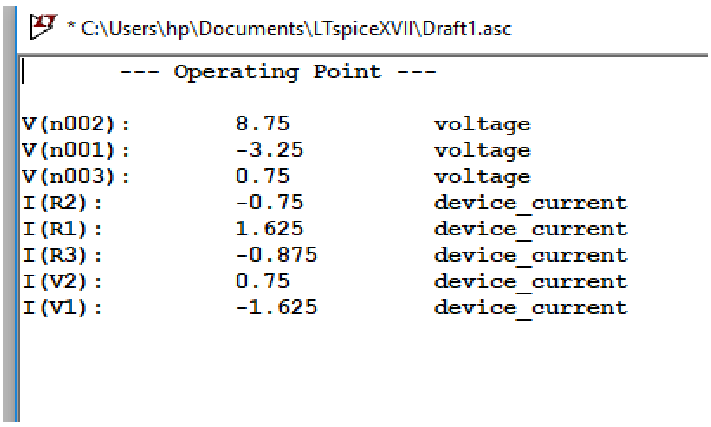
KEYWORDS: dc network, simulation of dc network theorems using examples.

INTRODUCTION
There are lots of theorms that provides us different ways to evaluate dc circuits some of them are kvl and kcl theorms , superposition ,thevinen,nortan theorms mesh and nodal they are specially applied to topologies with different prominent features and not only that they all can be applied to same topology but it becomes tedious in nature so iteration methods programme used by simulation softwares provide us a unique and onsome method so our main objective of this paper is not mere simulation of D.C circuits but also comparison of results calculated by both methods.

k.v.l and k.c.l theorms



Simulated problem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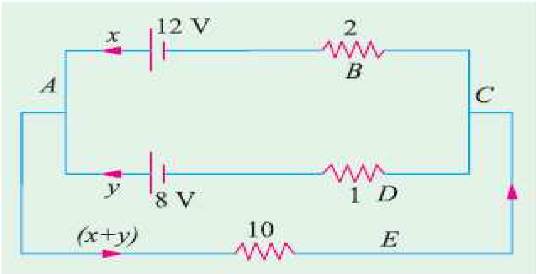
--- Operating Point ---

V(n002):	8.75	voltage
V(n001):	-3.25	voltage
V(n003):	0.75	voltage
I(R2):	-0.75	device_current
I(R1):	1.625	device_current
I(R3):	-0.875	device_current
I(V2):	0.75	device_current
I(V1):	-1.625	device_current

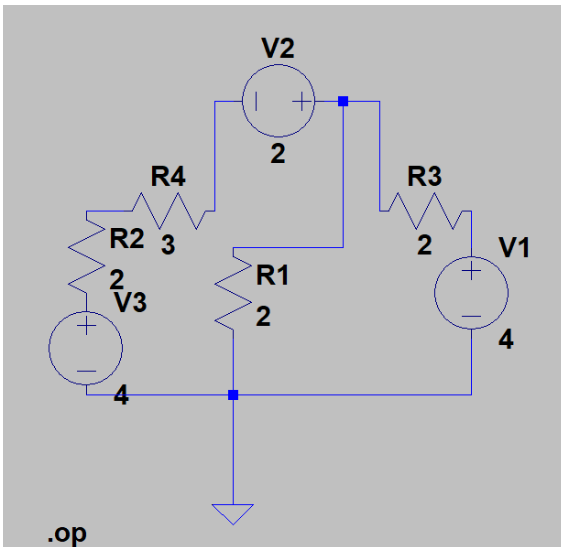
Manual calculation



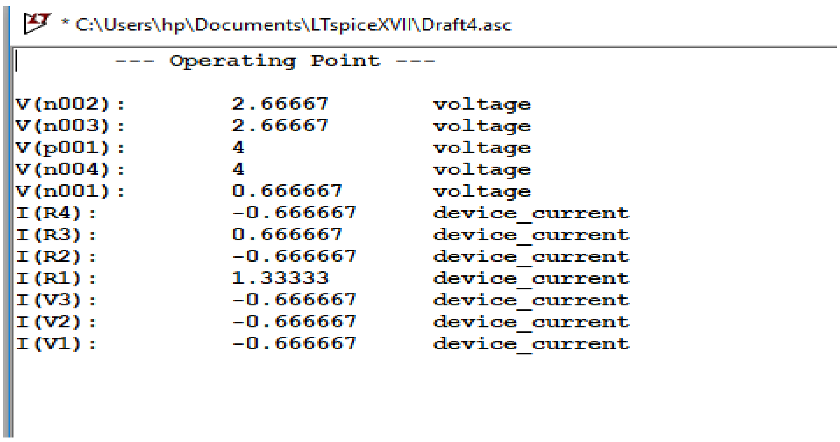
Applying KVL to the closed circuit

ABCDA , we get
□12 + 2x □□1y + 8 = 0 or 2x □y = 4 ...**(i)**
Similarly, from the closed circuit ADCEA, we get□□8 + 1y + 10 (x + y) = 0 or 10x + 11y = 8**(ii)**
From Eq. **(i)** and **(ii),** we get
x = **1.625 A** and y = **0.75 A**
The negative sign of y shows that the current is flowing into the 8-V battery and not out of it. In other words, it is a charging current and not a discharging current.
Current flowing in the external resistance = x + y = 1.625 □□0.75 = **0.875 A**
P.D. across the external resistance = 10 × 0.875 = **8.75 V**

NODAL ANALYSIS
SIMULATED PROBLEM



SIMULATED SOLUTION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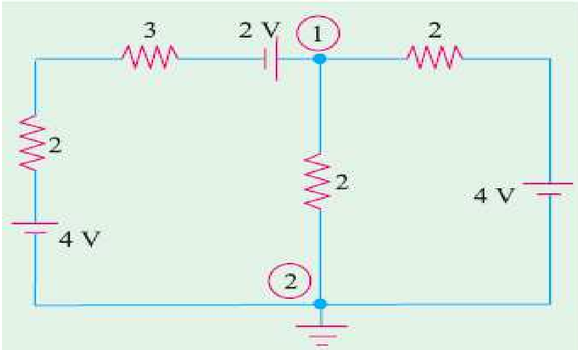
--- Operating Point ---

V(n002):	2.66667	voltage
V(n003):	2.66667	voltage
V(p001):	4	voltage
V(n004):	4	voltage
V(n001):	0.666667	voltage
I(R4):	-0.666667	device_current
I(R3):	0.666667	device_current
I(R2):	-0.666667	device_current
I(R1):	1.33333	device_current
I(V3):	-0.666667	device_current
I(V2):	-0.666667	device_current
I(V1):	-0.666667	device_current

MANUAL SOLUTION.

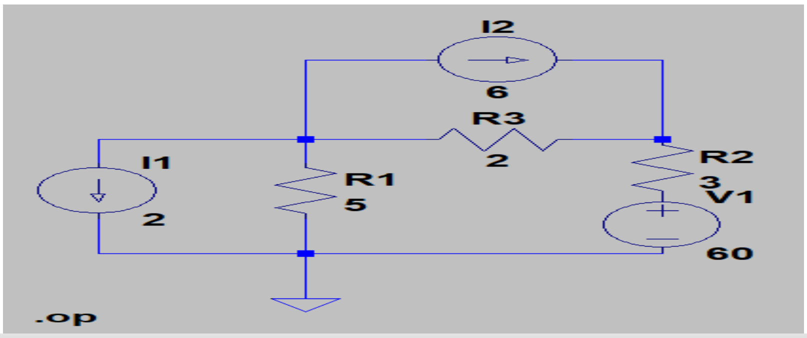


Node 2 has been taken as reference node .we will now find the value of node voltage v1.Using the technique we get V1(1/5+1/2+1/2)-2-(4/5+2/5)=0

The reason for adding two battery volatages of 2 v and 4 v is that they are in series now the v1 =8/3.

SUPERPOSITION THEORM

SIMULATED PROBLEM



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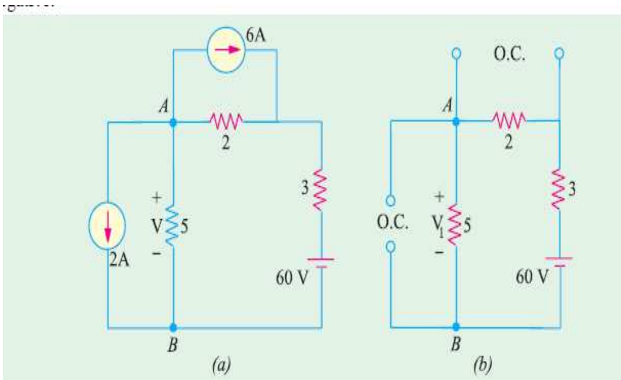
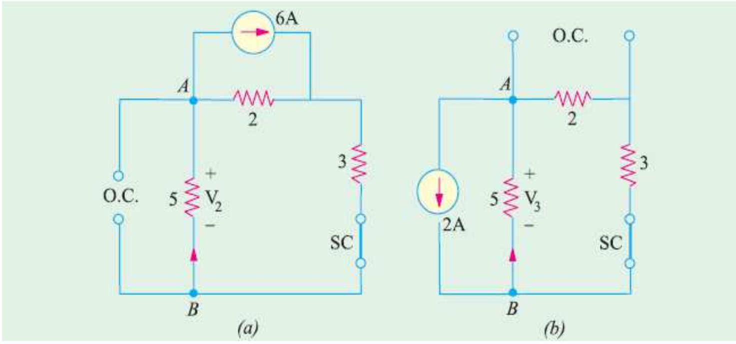
--- Operating Point ---

V(n001):      19        voltage
V(n002):      42.6      voltage
V(p001):      60        voltage
I(I2):        6         device_current
I(I1):        2         device_current
I(R3):        11.8      device_current
I(R2):        -5.8      device_current
I(R1):        3.8       device_current
I(V1):        -5.8      device_current
```

MANUAL SOLUTION



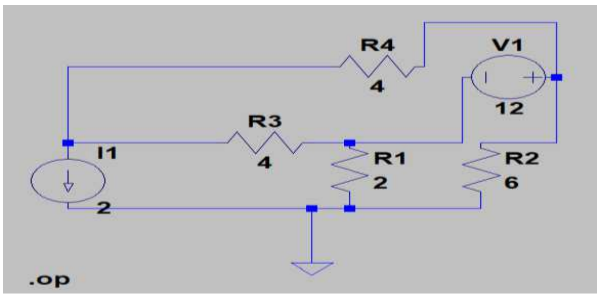


The redrawn circuit with the voltage source acting alone while the two current sources have been 'killed' i.e. have been replaced by open circuits. Using voltage divider principle, we get V1 = 60 × 5/(5 + 2 + 3) = 30 V. It would be taken as positive, because current through the 5 Ω resistances flows from A to B, thereby making the upper end of the resistor positive and the lower end negative.
(a) shows the same circuit with the 6 A source acting alone while the two other sources
have been 'killed'. It will be seen that 6 A source has to parallel circuits across it, one having a resistance of 2 Ω and the other (3 + 5) = 8 Ω. Using the current-divider rule, the current through the 5 Ω resistor = 6 × 2/(2 + 3 + 5) = 1.2 A.
Because (b) resembles a voltage source with an internal resistance = 4 + 10 || 40 = 12 Ω and
which is an open-circuit.

DC NETWORK

∴ V2 = 1.2 × 5 = 6 V. It would be taken **negative** because current is flowing from B to A. i.e.
point B is at a higher potential as compared to point A. Hence, V2 = − 6 V.
(b) shows the case when 2-A source acts alone, while the other two sources are dead.
As seen, this current divides equally at point B, because the two parallel paths have equal resistances of 5 Ω each. Hence, V3 = 5 × 1 = 5 V. It would also be taken as negative because current flows from sB to A. Hence, V3 = − 5 V.
Using Superposition principle, we get
V = V1 + V2 + V3 = 30 − 6 − 5 = **19 V**

THEVENIN THEOREM
SIMULATED SOLUTION



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       --- Operating Point ---

V(n003):        -6          voltage
V(n001):        6           voltage
V(n002):        -4          voltage
I(I1):          2           device_current
I(R4):          2.5         device_current
I(R3):          -0.5        device_current
I(R2):          1           device_current
I(R1):          -3          device_current
I(V1):          -3.5        device_current
```
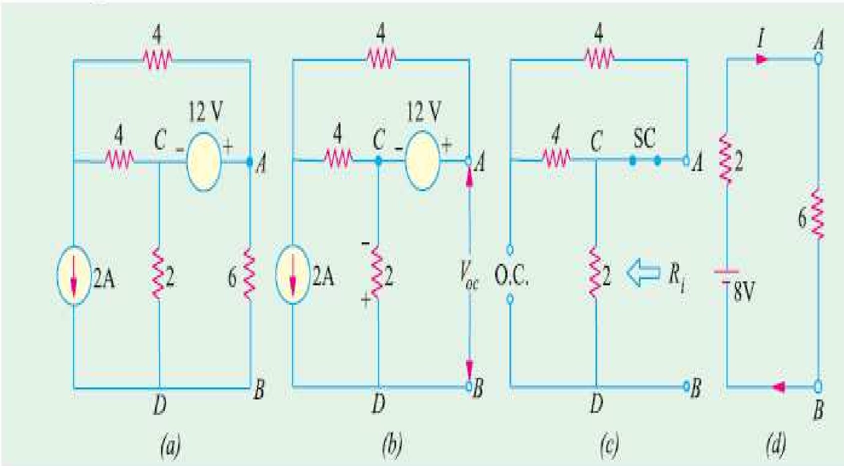

MANUAL SOLUTION



When 6 Ω resistor is removed whole of 2 A current flows along
DC producing a drop of (2 × 2) = 4 V with the polarity as shown. As we go along BDCA, the
total voltage is = − 4 + 12 = 8 V —with A positive w.r.t. B. Hence, Voc = Vth = 8 V
For finding Ri or Rth 18 V voltage source is replaced by a short-circuit (Art- 2.15) and the current source by an open-circuit, as shown in Fig. 2.149 (c). The two 4 Ω resistors are in series and are thus equivalent to an 8 Ω resistance. However, this 8 Ω resistor is in parallel with a short of 0 Ω. Hence, their equivalent value is 0 Ω. Now this 0 Ω resistance is in series with the 2 Ω resistor. Hence, Ri = 2 + 0 = 2 Ω. The Thevenin's equivalent circuit is shown in
∴ I = 8/(2 + 6) = **1 Amp**

CONCLUSIONS

As the above results shows that the DC networks can be successfully modelled and simulated using softwares/LT spice and results can be compared and as above paper clearly shows that iterated results of simulation softwares /LT spice and manually calculated results of DC network theorms clearly match so above results are verified.

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