SOMAIYA
VIDYAVIHAR UNIVERSITY

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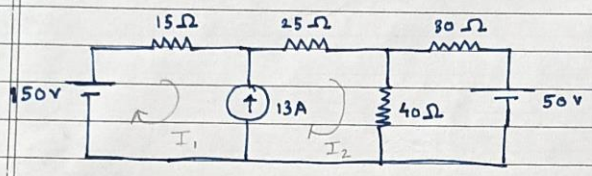
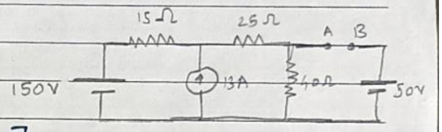
Course : EEEE - IA
Experiment / assignment / ~~tutorial~~ No. 1
Grade: Signature of the Faculty with date

5/11/2023

Q1].



① Finding V_{TH}



$I_2 - I_1 = 13$ —— ① [supermesh]

Using KVL in loop ① & ②,

$150 - 15I_1 - 25I_2 - 40I_2 = 0$

$\therefore \quad 15I_1 + 65I_2 = 150$ —— ②

Solving ① & ②,

$\therefore \quad I_1 = -8.6875\ A$

$I_2 = 4.3125\ A$

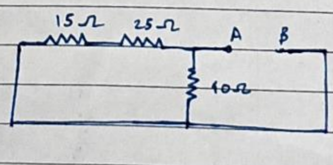
Applying KVL in loop ③,

$40I_2 - V_{TH} - 50 = 0$

$V_{TH} = 40I_2 - 50$

$V_{TH} = 122.5\ V$

② Finding R_{TH}



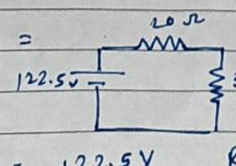
$15 + 25 = 40\ \Omega$

$\therefore (40 \parallel 40) = 20\ \Omega$

$\therefore R_{TH} = 20\ \Omega$

③ Finding I_L

$\therefore I_L =$

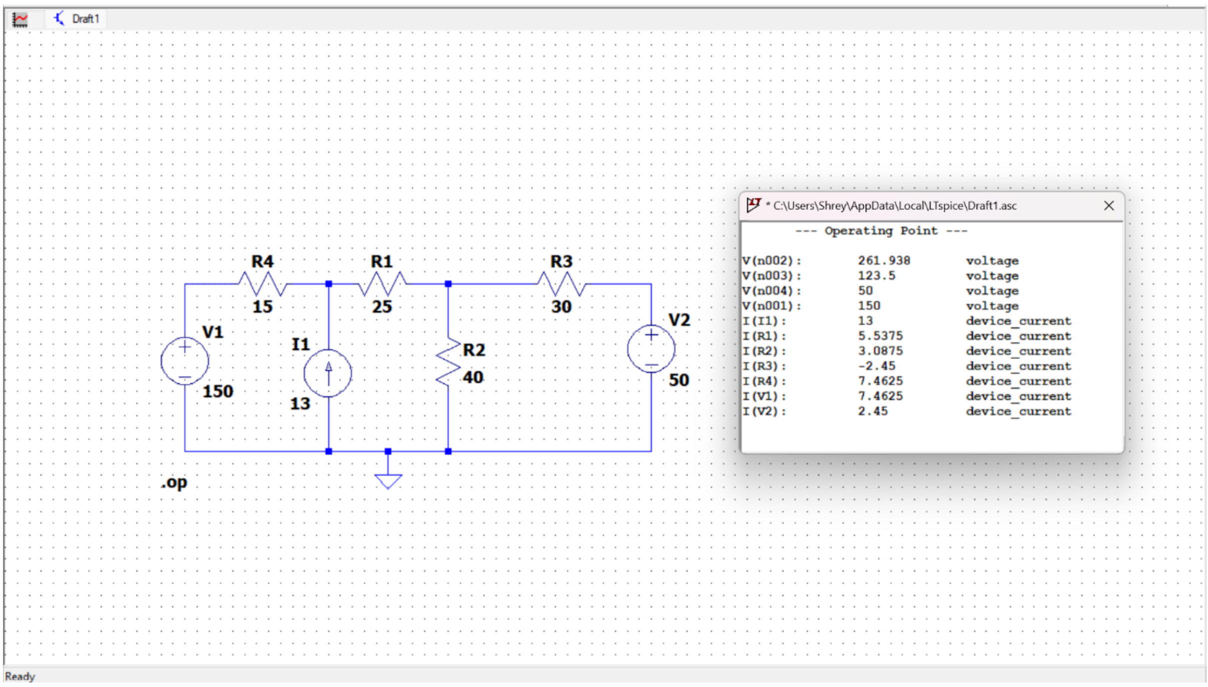


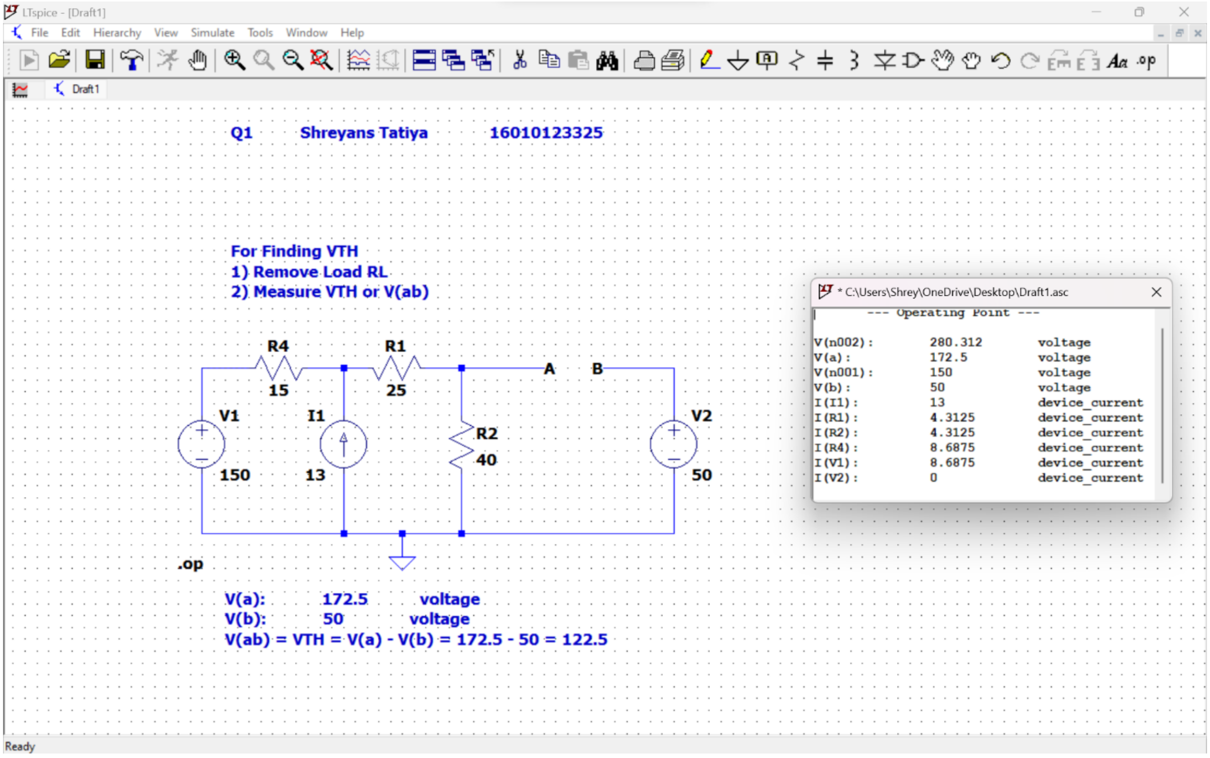
$\therefore I_L = \dfrac{122.5}{20+30} = 2.45A$

$\therefore V_{TH} = 122.5V, \quad R_{TH} = 20\Omega, \quad I_L = 2.45\ A$

Simulate the circuit shown in figure 1, using LTspice software and measure Vth, Rth and IL. Tabulate the results as shown in the table below.

Parameter	Theoretical value	Simulated value
Thevenin's voltage Vth	122.5 V	122.5V
Thevenin's resistance Rth	20 Ω	20 Ω
Load current IL	2.45 A	2.45 A




LTspice - [Draft1]
File Edit Hierarchy View Simulate Tools Window Help
Draft1
Q1 Shreyans Tatiya 16010123325
For Finding VTH
1) Remove Load RL
2) Measure VTH or V(ab)
R4
15
R1
25
A
B
V1
150
I1
13
R2
40
V2
50
.op
V(a): 172.5 voltage
V(b): 50 voltage
V(ab) = VTH = V(a) - V(b) = 172.5 - 50 = 122.5
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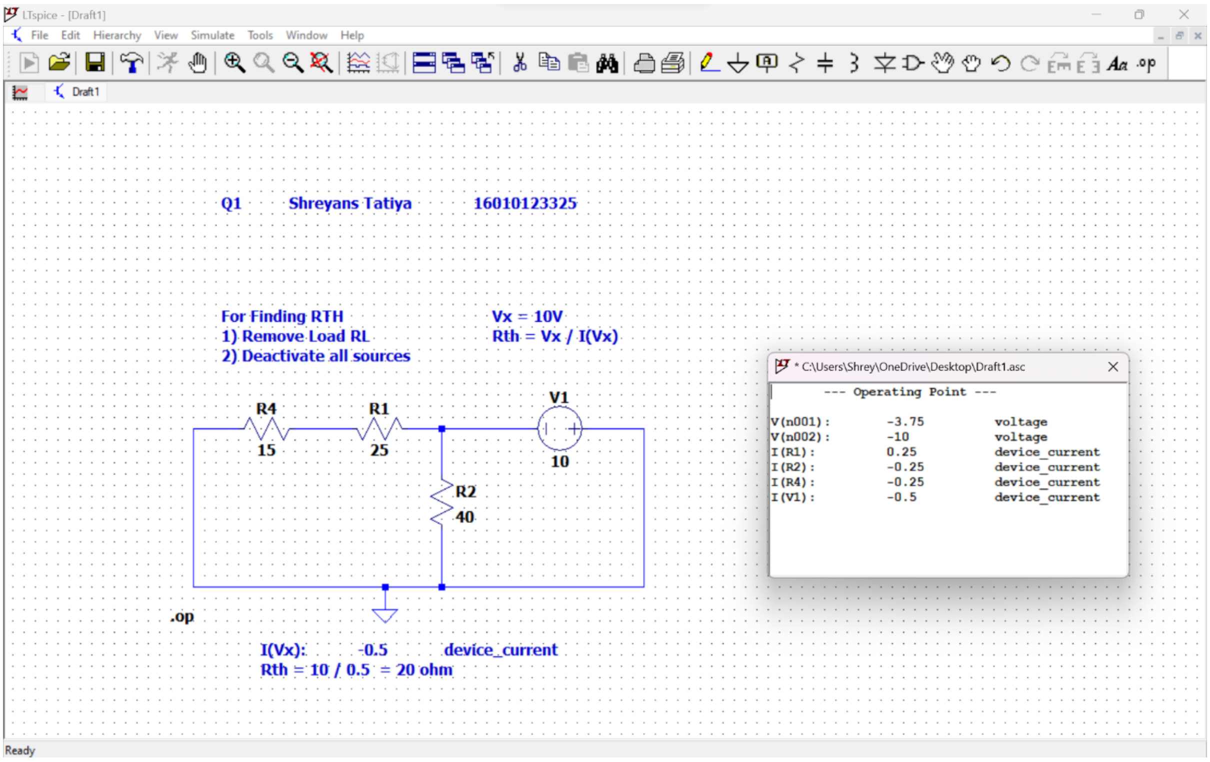
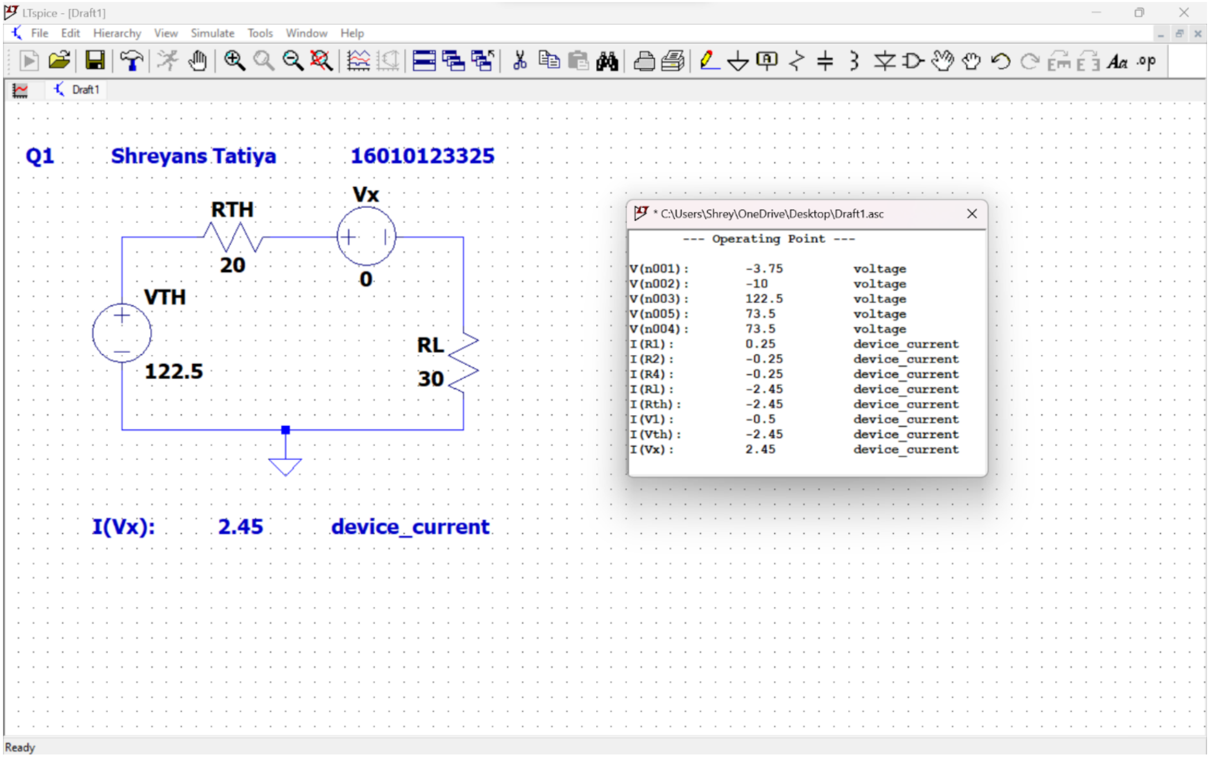
--- Operating Point ---
V(n002): 280.312 voltage
V(a): 172.5 voltage
V(n001): 150 voltage
V(b): 50 voltage
I(I1): 13 device_current
I(R1): 4.3125 device_current
I(R2): 4.3125 device_current
I(R4): 8.6875 device_current
I(V1): 8.6875 device_current
I(V2): 0 device_current
Ready


LTspice - [Draft1]
File Edit Hierarchy View Simulate Tools Window Help
Draft1
Q1 Shreyans Tatiya 16010123325
For Finding RTH
1) Remove Load RL
2) Deactivate all sources
Vx = 10V
Rth = Vx / I(Vx)
R4
15
R1
25
V1
10
R2
40
.op
I(Vx): -0.5 device_current
Rth = 10 / 0.5 = 20 ohm
* C:\Users\Shrey\OneDrive\Desktop\Draft1.asc
--- Operating Point ---
V(n001): -3.75 voltage
V(n002): -10 voltage
I(R1): 0.25 device_current
I(R2): -0.25 device_current
I(R4): -0.25 device_current
I(V1): -0.5 device_current
Ready


LTspice - [Draft1]
File Edit Hierarchy View Simulate Tools Window Help
Draft1
Q1
Shreyans Tatiya
16010123325
Vx
RTH
20
0
VTH
122.5
RL
30
I(Vx): 2.45 device_current
* C:\Users\Shrey\OneDrive\Desktop\Draft1.asc
--- Operating Point ---
V(n001): -3.75 voltage
V(n002): -10 voltage
V(n003): 122.5 voltage
V(n005): 73.5 voltage
V(n004): 73.5 voltage
I(R1): 0.25 device_current
I(R2): -0.25 device_current
I(R4): -0.25 device_current
I(Rl): -2.45 device_current
I(Rth): -2.45 device_current
I(V1): -0.5 device_current
I(Vth): -2.45 device_current
I(Vx): 2.45 device_current
Ready

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Q4) Explain the principle and working of the Energy Meter with a neat labelled diagram.

Principle:

→ A single phase Energy meter is used for measuring the power consumed in Kilowatt-hours (KWh) of a domestic or industrial electrical installation.
On a single phase AC supply, the electromechanical induction by counting the revolutions of a non-magnetic, but electricity conductive, metal disc which is made to rotate at a speed proportional to the power passing through the meter

Construction:

→ A single phase energy meter is a sort of induction type watt-hour meter. It consists of two electromagnets. When the meter is connected to the supply line and the load, then both the coils produce their magnetic fields. The field produced by the circuit coils directly proportional to the magnitude of the current flowing through it. The field produced by the pressure coil depends on the voltage across it. Both the fluxes producing and two eddy currents and therefore two driving, torques resultant produced on the disc.

The damping torque is produced by the permanent magnet. Shading rings are mounted on the shunt magnet for the correction in power factor of the meter. The rotational speed of the disc is counted by a counting mechanisms which may be of any-one of the types (cyclo dial, clock dial, number dial).

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Diagram