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MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

S. Y. B. Tech. (Electrical and Computer Engineering)

Semester: IV **Subject: Electrical Circuit Analysis**

Name: Shreerang. Mhatre **Class:** Electrical &computer

Roll No: 29 **Batch:** A2

Experiment No: 08

Name of the Experiment: Verification of Thevenin's Theorem using MATLAB Simulink.

Performed on: 1/11/2022

Submitted on: 9/11/2022

Marks	Teacher's Signature with Date
	9-11-22

Aim: To verify the Thevenin's Theorem using MATLAB Simulink.

Prerequisite: Knowledge of network theorem and MATLAB Simulink.

Theory:

Thevenin's Theorem states that "Any linear circuit containing several voltages and resistances can be replaced by just one single voltage in series with a single resistance connected across the load". In other words, it is possible to simplify any electrical circuit, no matter how complex, to an equivalent two-terminal circuit with just a single constant voltage source in series with a resistance (or impedance) connected to a load as shown below.

Thevenins Theorem is especially useful in the circuit analysis of power or battery systems and other interconnected resistive circuits where it will influence the adjoining part of the circuit.

Thevenins theorem can be used as another type of circuit analysis method and is particularly useful in the analysis of complicated circuits consisting of one or more voltage or current source and resistors that are arranged in the usual parallel and series connections.

While Thevenin's circuit theorem can be described mathematically in terms of current and voltage, it is not as powerful as Mesh Current Analysis or Nodal Voltage Analysis in larger networks because the use of Mesh or Nodal analysis is usually necessary in any Thevenin exercise, so it might as well be used from the start. However, Thevenin's equivalent circuits of Transistors, Voltage Sources such as batteries etc, are very useful in circuit design.

Procedure:

1. Start MATLAB.
2. Start Simulink, open the blank model.

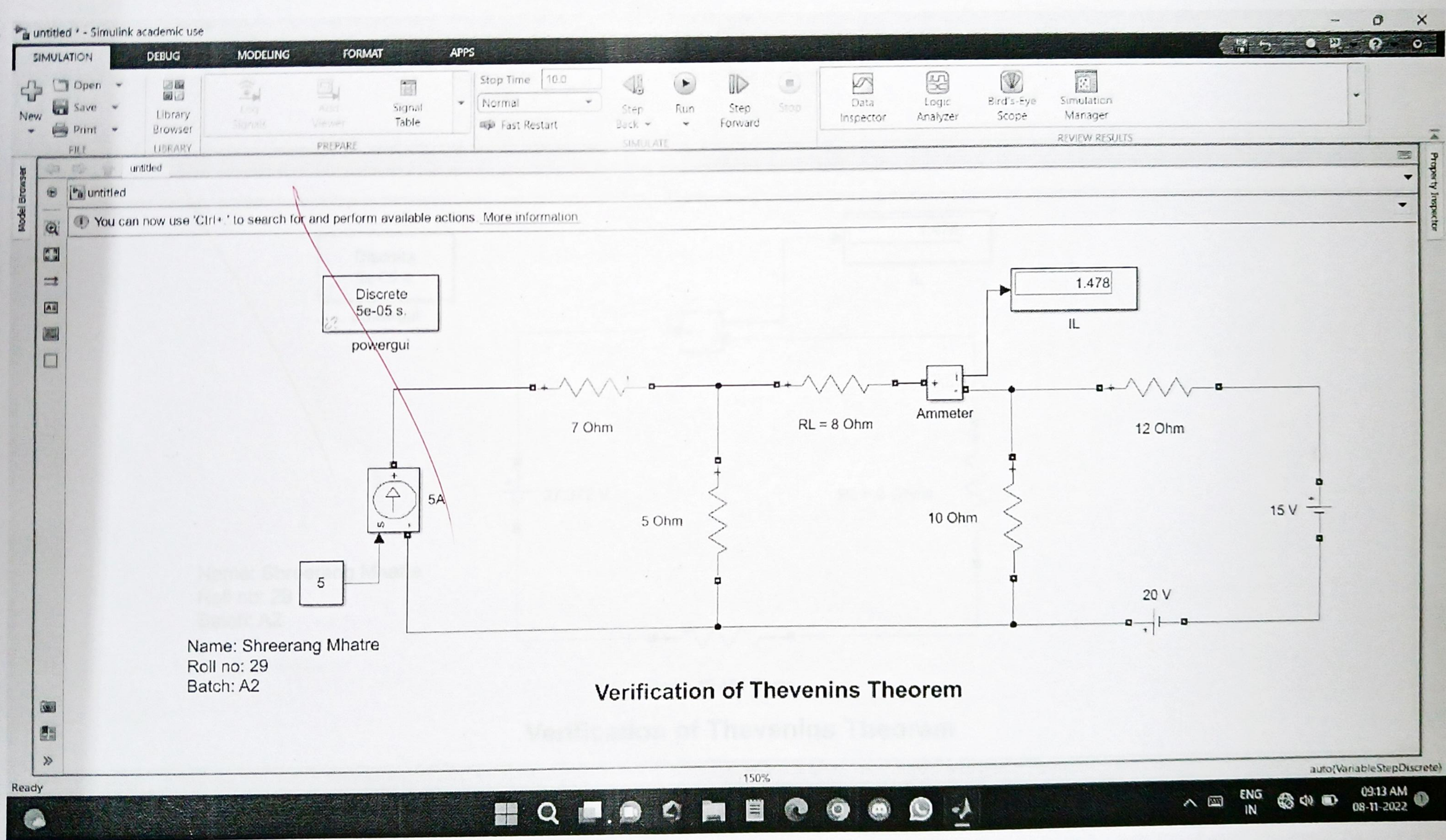
3. Build the circuit as given in the class and measure current in required branch.
4. Build new circuit by removing load resistance and measure open V_{th} across open circuited terminals.
5. Measure equivalent resistance at open circuited terminals.
6. Build a Thevenin's equivalent circuit and measure current through load resistance and match the value with calculated answer.

Activity:

Attach screenshots of above activity.

Post Lab Questions:

1. Show the detailed solution of the above problem.
2. Write applications of Thevenin's and Norton's theorem.
3. State limitations of Thevenin's and Norton's theorem.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Roll no: 29
Batch: A2
Verification of Thevenins Theorem
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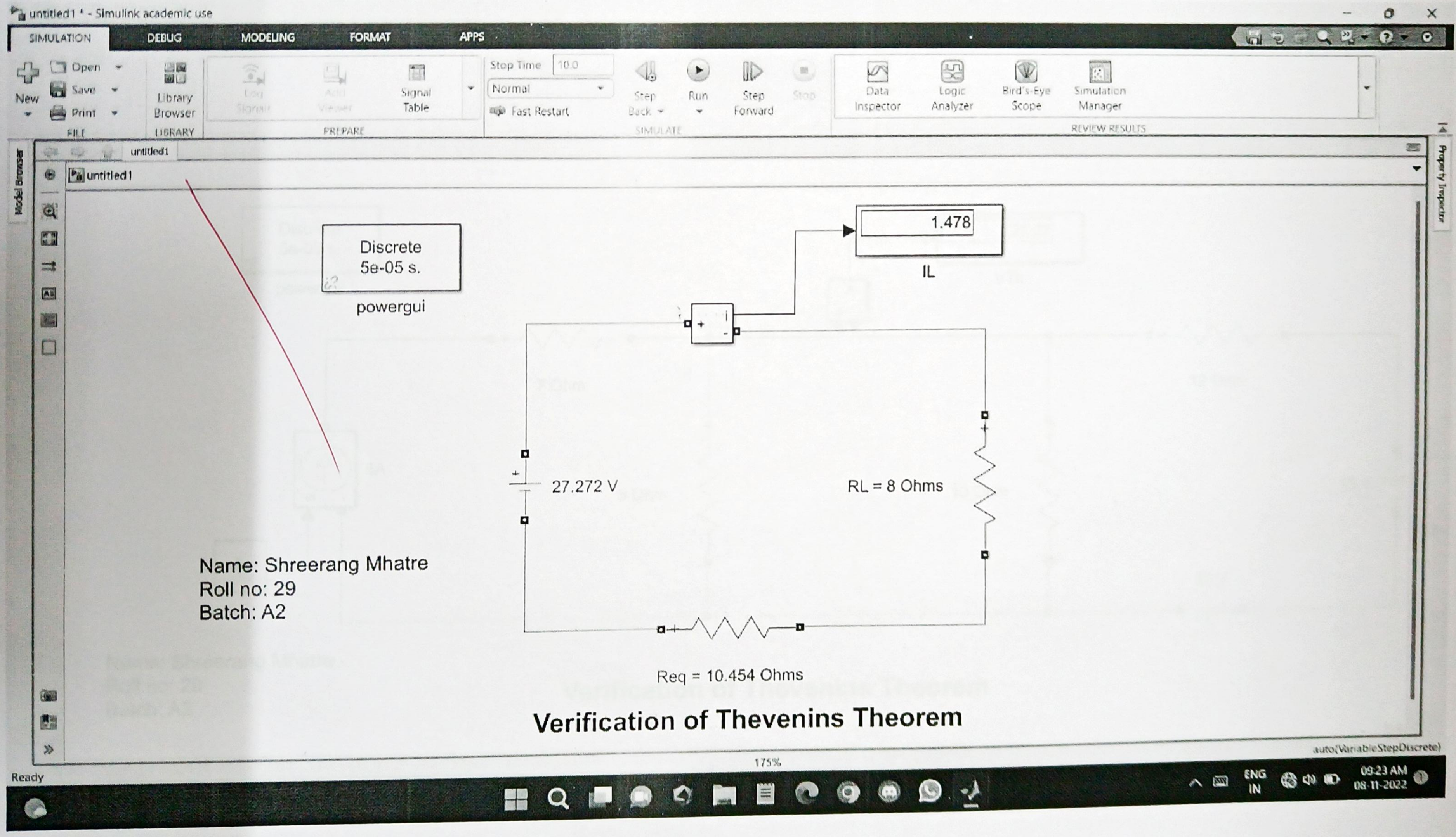
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Bird's-Eye Scope
Simulation Manager
REVIEW RESULTS
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IL
27.272 V
RL = 8 Ohms
Req = 10.454 Ohms
Name: Shreerang Mhatre
Roll no: 29
Batch: A2
Verification of Thevenins Theorem
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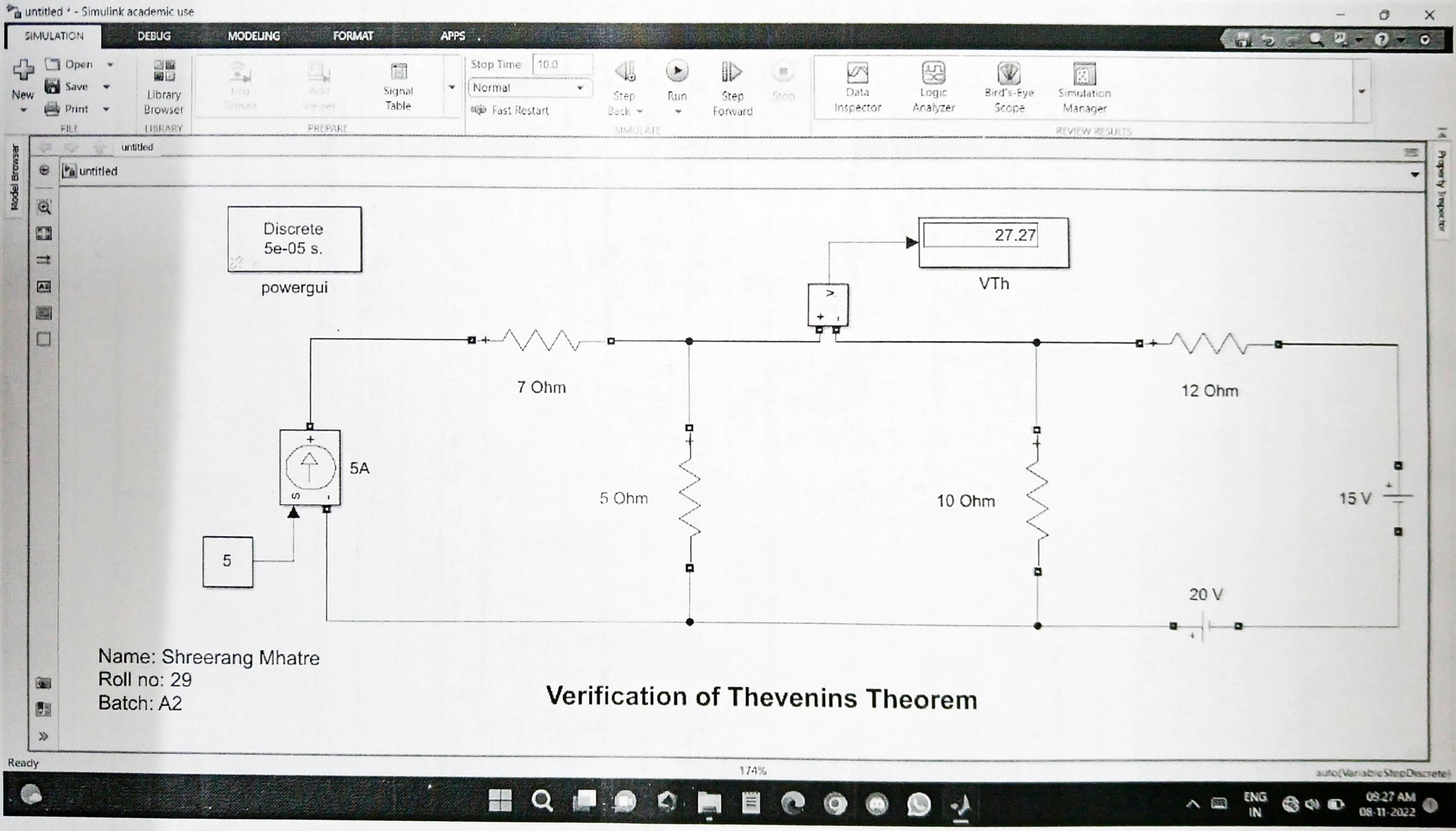
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10 Ohm
15 V
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20 V
Name: Shreerang Mhatre
Roll no: 29
Batch: A2
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* Post lab Questions:

Q 1) Show detailed solution of the above problem

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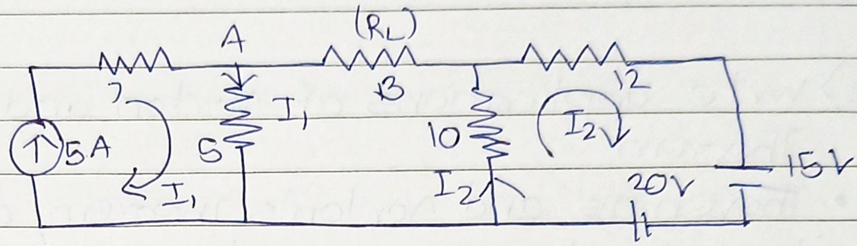
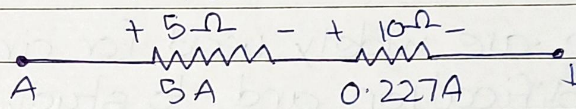


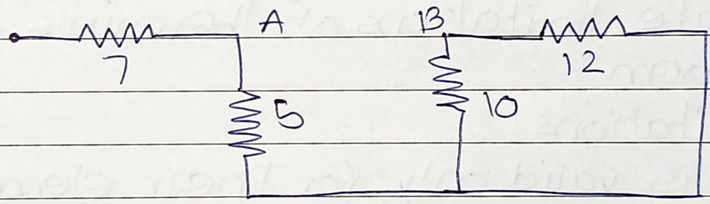
$I_1 = 5A$

$$I_2 = \frac{V}{R} = \frac{20V - 15V}{10 + 12} = \frac{5}{22} A = 0.227A$$



$V_{Th} = 5(5) + 10(0.227) = 25 + 2.272$

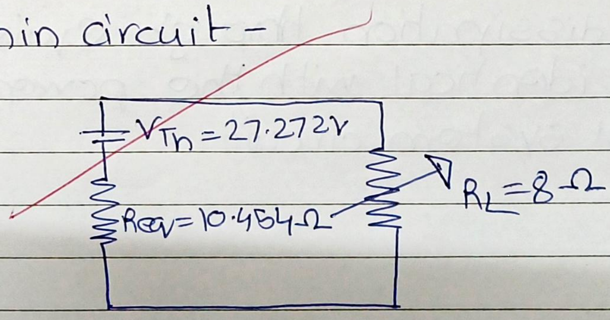
$\therefore V_{Th} = 27.272V$



$$R_{eq} = (10 \parallel 12) + 5 = \frac{120}{22} + 5 = 5.454 + 5$$

$\therefore R_{eq} = 10.454\,\Omega$

Thevenin circuit -



$$\therefore I_L = \frac{V_{Th}}{R_{eq}+R_L} = \frac{27.272}{10.454+8}$$

$$\therefore \underline{I_L = 1.478A}$$

Q 2) Write applications of Norton and Thevenin's Theorem

→ • Thevenin's and Norton's Theorem are used where load can be varied and hence, can be used to find load current for various loads in a circuits

• These are widely used for circuit analysis simplification and to study circuit's initial condition and steady state response.

Q 3) State limitations of Thevenin's and Norton's Theorem

→ Limitations:

① It is valid only for linear elements and not for non-linear circuits.

② Not applicable to circuits consisting of non-linear or unilateral elements (eg: Diodes, Transistors)

③ Power dissipation through equivalent circuit is not identical with the power dissipation in real system circuit.

9-11-22

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