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| **Course Name:** | **Elements of Electrical and Electronics Engineering Laboratory** | **Semester:** | **I** |
| **Date of Performance:** | **20/ 09/2024** | **Batch No:** | **C4-1** |
| **Student Name:** | **Dhruv Pankhania** | **Roll No:** | **16010124216** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/ 20** |

**Experiment No: 3**

**Title:** **Thevenin’s Theorem & Norton’s Theorem**

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| **Aim and Objective of the Experiment:** |
| * To Verify for Thevenin’s Theorem for the circuit * To Verify Norton Theorem for the Circuit. |

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| **COs to be achieved:** |
| **CO1:** Analyze resistive networks excited by DC sources using various network theorems. |

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| **Circuit Diagram:** |
| **Task 1: Circuit Diagram to measure RTH/RN:**    **Task 2: Circuit Diagram to measure VTH:**    **Task 3: Circuit Diagram to measure ISC:** |

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| **Stepwise-Procedure:** |
| **Thevenin’s Theorem:**  1. Connect the circuit as shown in the circuit diagram.  2. Set 10V and measure open circuit voltage VTh across load terminals A and B.  3. Replace all voltage sources by Short circuit and measure RTh across terminals A and B as per the circuit diagram shown in the figure.  4. Draw Thevenin’s equivalent circuit and determine the value of load current from it.  5. Verify the results theoretically.  **Norton’s Theorem:**  1. Connect the circuit as shown in the circuit diagram.  2. Set the voltages 10V  3. Remove the load resistance and measure the short circuit current ISC through A and B terminals.  4. Replace all the voltage sources by Short circuit and measure RTh across terminals A and B as per the circuit diagram shown in the figure.  5. Draw Norton’s equivalent circuit and determine the value of load current.  6. Verify the results theoretically |
| **Calculations:**   1. **Find RTH**   470 Ω || 330 Ω = 193.875 Ω (parallel)  47 Ω || 220 Ω = 38.726 Ω (series)  RTH = 193.875 +38.726 = 232.601 Ω   1. **Find VTH**   I1 = = 0.0125 A  I2 = 0.0374 A  VTH = -22012 + 33011  VTH = -220(0.0374) + 330(0.0125)  VTH = -4.103 V (↑) = +4.103 V (↓)  **KVL to loop 1**  - 47I1 - 470(I1 - I3) = 0  - 517I1 + 470I3 = 0 ……….. (1)  **KVL to loop 2**  - 220I2 - 330(I2 - I3) = 0  - 550I2 + 330I3 = 0 ………. (2)  **KVL to loop 3**  - 10 - 330(I3 - I2) - 470(I3 - I1) = 0  - 10 - 800I3 + 330I2 + 470I1 = 0  470I1 + 330I2 - 800I3 = 10 ……….. (3)  **Solving (1), (2) & (3)**  **I1 = - 0.052A**  **I2 = - 0.0348A**  **I3 = - 0.0572A**  **For Norton`s Theorem - Short-circuit current IN​:**  IN = I1-I2 = -0.0177A = -17.7 mA  IL = IN x RTH (RTH + RL) = 17.7 x = 12.378 mA  **For Thevenin’s Theorem – IL**  IL = VTH (RTH + RL) = = 0.012336 = 12.336 mA |

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| **Observation Table:** |
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| **Draw Thevenin’s Equivalent circuit**    **Draw Norton’s Equivalent circuit** |

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| **Conclusion:** |
| This experiment guides us through the steps to verify Thevenin’s and Norton’s theorems for a given circuit. It demonstrates that Thevenin and Norton resistances are equivalent. Additionally, it shows how any linear circuit can be simplified to an equivalent circuit with a single voltage source and a series resistance connected to the load. Through this experiment, we also explored the analysis of resistive networks powered by DC sources using various network theorems. |

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| **Signature of faculty in-charge with Date:** |