**Norton Equivalent Circuit:**

The Norton equivalent circuit is the current source equivalent of the Thevenin equivalent circuit. The Norton circuit is basically a current source in parallel with an equivalent resistance with its output terminals across this parallel circuit.

\[
\text{Norton Circuit}
\]

In ECE-2010 the Norton equivalent will only be derived from the Thevenin equivalent circuit. The procedure to do this can be stated in the following two rules.

1. The Norton equivalent resistance is numerically equal to the Thevenin resistance.
   \[ R_n = R_{th} \]

2. The output current of the Norton current source is derived by shorting the output terminals (A, B) of the Thevenin equivalent circuit then calculating the value of the current that flows in this short. Shorting the output terminal with a wire turns the Thevenin circuit into a simple series circuit where Ohm's Law can then be used to calculate the series circuit current. This series circuit current is equivalent to the Norton source current.

   \[ I_n = \frac{E_{th}}{R_{th}} \]

The following example will be used to demonstrate this procedure.

Calculating the Norton current from the above circuit,

\[ I_{sc} = I_n = \frac{50}{200} = 0.25 \text{ amps} \]

Then the Norton current,

\[ R_n = R_{th} = 200 \text{ ohms} \]
The Norton equivalent circuit would then be,

![Norton Circuit Diagram]

Now let’s add a 300 ohms load to the output of both the Thevenin and Norton equivalent circuits.

![Thevenin Circuit Diagram]

![Norton Circuit Diagram]

\[
I_L = \frac{E_{th}}{R_n + R_L} = \frac{50}{200 + 300} = \frac{50}{500} = 0.1 \text{ amps}
\]

\[
R_p = \frac{R_n R_L}{R_n + R_L} = \frac{(200)(300)}{(200 + 300)} = \frac{60000}{500} = 120 \text{ ohms}
\]

\[
V_{ab} = I_L R_L = (0.1)(300) = 30 \text{ volts}
\]

\[
V_{ab} = I_n R_p = (0.25)(120) = 30 \text{ volts}
\]

\[
I_n = I_{th} = \frac{30}{300} = 0.1 \text{ amps}
\]

Conclusion: Both of the above circuits are equivalent at terminals A,B and yield the same results at those terminals. Hence both Thevenin and Norton are terminal equivalent circuits.

JOR