**EEET-121 AC Circuits**

TEAM Quiz #7 2185 — Thevenin, Norton and Pmax

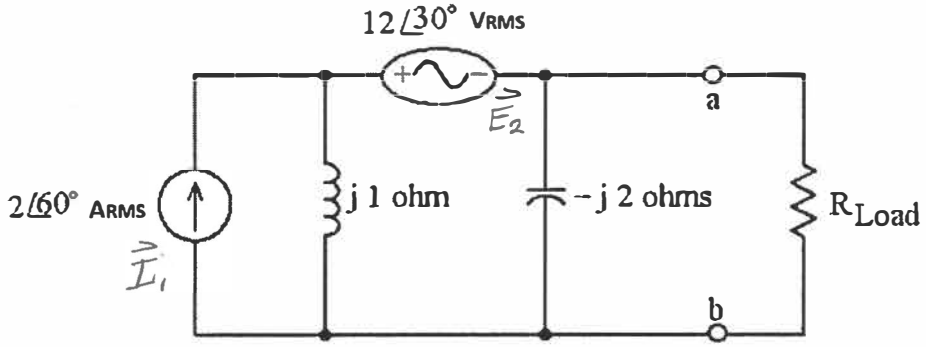
**TEAM NAME** * SOLUTIONS *

Team membe

**All 5 questions are equally weighted. Show your work and BOX-IN your final answer for credit.**

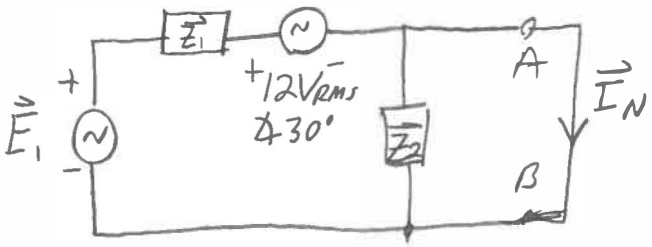
1. If $\mathbf{Z_{TH}} = (10 - j30)\ \Omega$ for a specific circuit, what must the load impedance be for maximum power transfer to occur from that circuit to the load?

$$\vec{Z}_L = \vec{Z}_{TH}^{\,*} = \boxed{(10 + j30)\ \Omega}$$




<u>For the circuit shown above, answer the following 2 questions:</u>

2. Find the value of **IN** for the Norton equivalent circuit external to $R_{LOAD}$




$\vec{Z}_1 = j1\ \Omega$

$\vec{Z}_2 = -j2\ \Omega$

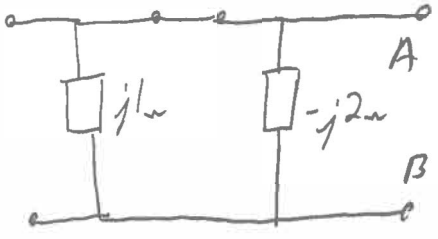
$\vec{E}_1 = \vec{I}_1 \vec{Z}_1$

$= 2V_{RMS} \angle 15°$

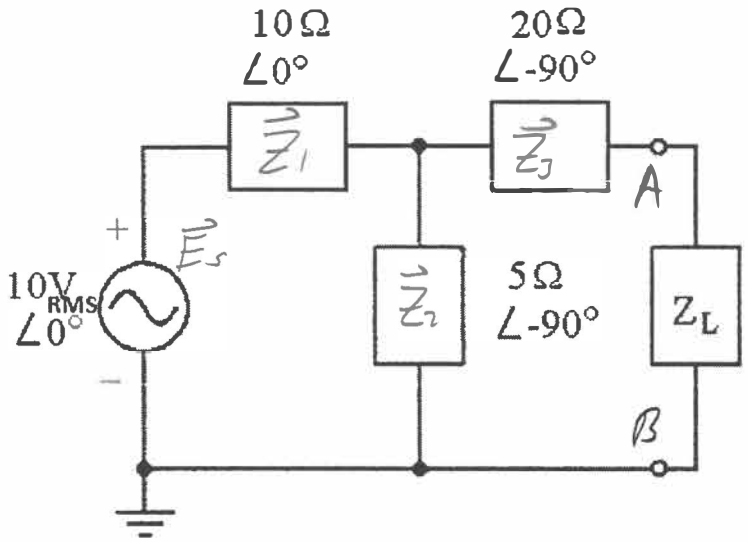
$$\vec{I}_N = \frac{\vec{E}_1 - \vec{E}_2}{\vec{Z}_1}$$

$$\vec{I}_N = \boxed{13.1 A_{RMS} \angle 112.4°}$$

3. Find the value of $Z_N$ for the Norton equivalent circuit external to $R_{LOAD}$

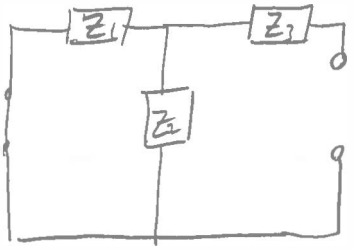



$$\vec{Z}_N = \boxed{+j2\ \Omega \text{ OR } 2\angle 90°}$$




For the circuit shown above, answer the following 2 questions:

4. What is the Thevenin impedance, $Z_{TH}$, external to $Z_L$?

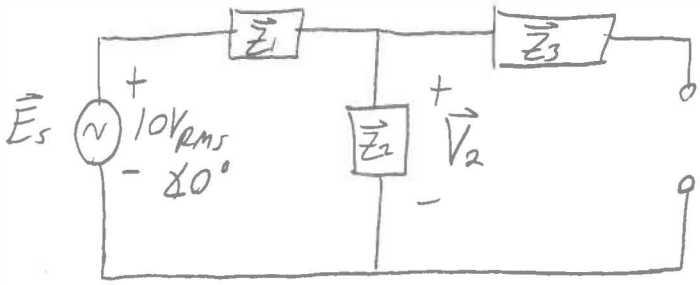



$\vec{Z}_{TH} = \vec{Z}_1 // \vec{Z}_2 + \vec{Z}_3$

$= (2-j4)\Omega + (-j20)\Omega$

$\vec{Z}_{TH} = (2-j24)\Omega$ or $24.1\angle -85.3^\circ\ \Omega$

5. What is the Thevenin voltage, $V_{TH}$, external to $Z_L$?




$+\ \vec{V}_{TH} = \vec{V}_2 = \vec{E}_s \left( \frac{\vec{Z}_2}{\vec{Z}_2 + \vec{Z}_1} \right)$

$= 10V_{RMS} \angle 0^\circ \left( \frac{5\Omega \angle -90^\circ}{5\Omega \angle -90^\circ + 10\Omega \angle 0^\circ} \right)$

$\vec{V}_{TH} = 4.47 V_{RMS} \angle -63.4^\circ$