Procedure

1. Given the AC circuit shown below in Figure 2.1, write out the complete set of node equations required to perform a **Nodal Analysis** of the circuit.

2. Utilize **MathCAD** to simultaneously solve the set of node equations, using the Matrix method shown in the textbook, in order to determine all of the node voltages in the circuit.

3. Use the Nodal Analysis results to determine the voltage $\tilde{V}_a$ and the current $\tilde{I}_4$ as shown in the figure.

R_1 = 30Ω, **X_{C1} = 20Ω,** **E_1 = (20+j30) = 36.1∠56.3° volts**
R_2 = 10Ω, **X_{C2} = 15Ω,** **E_2 = (15–j25) = 29.2∠–59.0° volts**
R_3 = 40Ω, **X_{L1} = 25Ω,** **E_3 = (5+j35) = 35.4∠81.9° volts**
R_4 = 25Ω, **X_{C1} = 50Ω,**
R_5 = 5Ω,

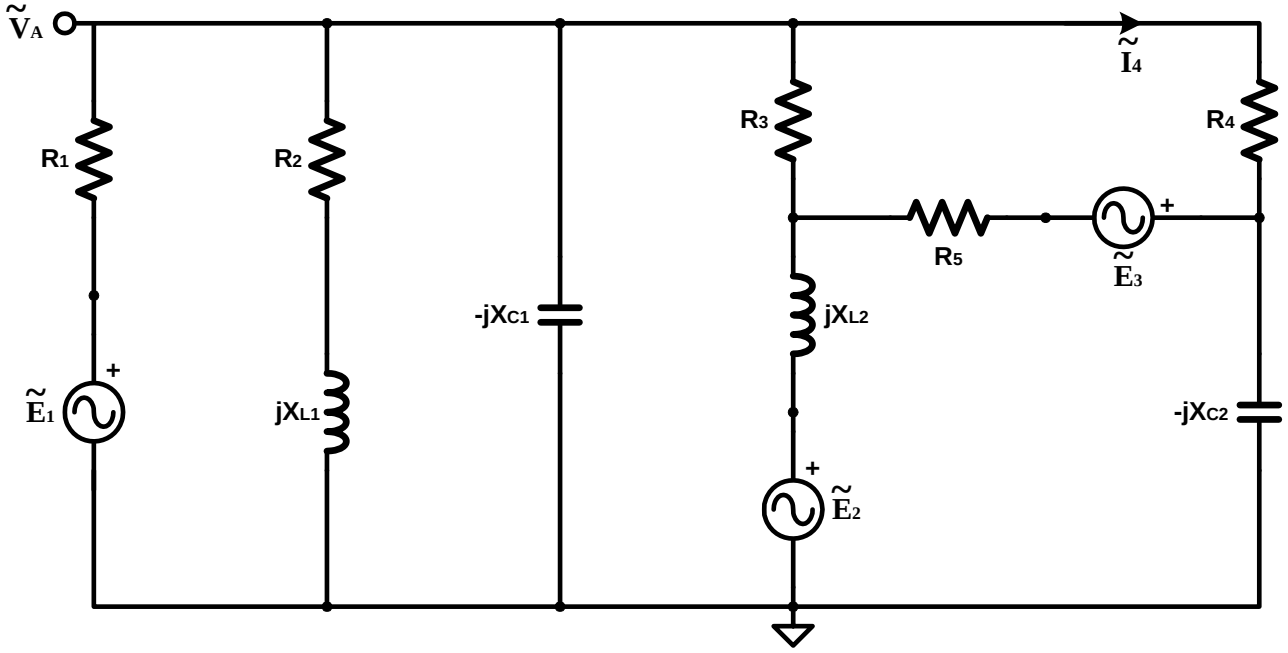

Figure 2.1 – AC Circuit

4. Given the same AC circuit shown below in Figure 2.1, write out the complete set of mesh equations required to perform a **Mesh Analysis** of the circuit.

5. Utilize **MathCAD** to simultaneously solve the set of mesh equations, using the Matrix method shown in the textbook, in order to determine all of the mesh currents in the circuit.

6. Use the Mesh Analysis results to determine the voltage $\tilde{V}_a$ and the current $\tilde{I}_4$ as shown in the figure.