Solving for I_A:

$$\frac{\begin{vmatrix} 12 & -330 & -300 \\ 0 & 1690 & -1000 \\ 0 & -1000 & 1690 \end{vmatrix}}{635202000} = \frac{(12)(1690)(1690) - (12)(-1000)(-1000)}{635202000} = 0.0351\text{ A} = 35.1\text{ mA}$$

Solving for I_B:

$$\frac{\begin{vmatrix} 630 & 12 & -300 \\ -330 & 0 & -1000 \\ -300 & 0 & 1690 \end{vmatrix}}{635202000} = \frac{(12)(-1000)(-300) - (-330)(12)(1690)}{635202000} = 0.0162\text{ A} = 16.2\text{ mA}$$

Solving for I_C:

$$\frac{\begin{vmatrix} 630 & -330 & 12 \\ -330 & 1690 & 0 \\ -300 & -1000 & 0 \end{vmatrix}}{635202000} = \frac{(12)(-330)(-1000) - (-300)(1690)(12)}{635202000} = 0.0158\text{ A} = 15.8\text{ mA}$$

The current in R_1 is the difference between I_A and I_B:

$$I_1 = (I_A - I_B) = 35.1\text{ mA} - 16.2\text{ mA} = \mathbf{18.9\ mA}$$

The current in R_2 is the difference between I_A and I_C:

$$I_2 = (I_A - I_C) = 35.1\text{ mA} - 15.8\text{ mA} = \mathbf{19.3\ mA}$$

The current in R_3 is I_B:

$$I_3 = I_B = \mathbf{16.2\ mA}$$

The current in R_4 is I_C:

$$I_4 = I_C = \mathbf{15.8\ mA}$$

The current in R_L is the difference between I_B and I_C:

$$I_L = (I_B - I_C) = 16.2\text{ mA} - 15.8\text{ mA} = \mathbf{0.4\ mA}$$

Related Problem Use a calculator to verify the loop currents in this example.

Use Multisim file E09-09 to verify the calculated results in this example and to confirm your calculations for the related problem.

useful three-loop circuit is the bridged-T circuit. While the circuit is primarily filter circuits using reactive components, it is introduced here to illustrate the circuit solution. A loaded resistive bridged-T is shown in Figure 9–13. will often be in kΩ (or even MΩ) so the coefficients for simultaneous equa- become quite large if they are shown explicitly in solving equations. To simplify solving equations with kΩ, it is common practice to drop the kΩ in the equa- recognize that the unit for current is the mA if the voltage is volts. The following bridged-T circuit illustrates this idea.