1.30 Find \( v \) and \( i \) for the series-parallel circuit shown in Fig. P1.30.

1.31 Find \( v \) and \( i \) for the series-parallel circuit shown in Fig. P1.31.

1.32 Consider the circuit shown in Fig. P1.32. (a) Find \( i \), \( v_1 \), \( v_2 \), and \( v_3 \). (b) Remove the short circuit between \( a \) and \( b \) (erase it), and find \( i \), \( v_1 \), and \( v_2 \). (Don't try to find \( v_3 \)—it can't be done!)

1.33 Consider the series-parallel circuit shown in Fig. P1.33. (a) Find \( V_s \) when \( v_1 = 2 \) V. (b) Find \( V_s \) when \( i_3 = 3 \) A. (c) Find \( V_s \) when \( i_5 = 4 \) A. (d) What is the resistance \( R_{eq} = V_s/i \) loading the battery for part (a)? For part (b)? For part (c)?
1.34 Consider the nonseries-parallel circuit shown in Fig. P1.34. (a) When $R = \frac{1}{2} \Omega$, then $v_1 = 6$ V. Determine the resistance $R_{eq} = V_s/i$ loading the battery.

1.35 Consider the nonseries-parallel circuit shown in Fig. P1.34. When $R = 4 \Omega$, then $v_1 = 4$ V. Determine the resistance $R_{eq} = V_s/i$ loading the battery.

1.36 Consider the nonseries-parallel circuit shown in Fig. P1.34. Determine $R$ and the resistance $R_{eq} = V_s/i$ loading the battery when $v_1 = 3$ V.
1.37 The nonseries-parallel circuit shown in Fig. P1.37 is known as a twin-T network. (a) When \( R_1 = 1 \, \Omega \) and \( R_2 = 3 \, \Omega \), then \( v_2 = 6 \, \text{V} \). Determine the resistance \( R_{\text{eq}} = V_s / i \) loading the battery.

1.38 For the twin-T network shown in Fig. P1.37, suppose that \( R_2 = \frac{3}{4} \, \Omega \) and \( v_2 = 3 \, \text{V} \). Determine \( R_1 \) and the resistance \( R_{\text{eq}} = V_s / i \) loading the battery.

1.39 Shown in Fig. P1.39 is a nonseries-parallel connection known as a bridge circuit. When \( R_1 = 10 \, \Omega \) and \( R_2 = 1 \, \Omega \), then \( v_1 = 10 \, \text{V} \). Find \( v_2, i, v_3, \) and the resistance \( R_{\text{eq}} = V_s / i \), loading the voltage source.

1.40 For the bridge circuit shown in Fig. P1.39, when \( R_1 = 2 \, \Omega \) and \( R_2 = 4 \, \Omega \), then \( v_1 = 4 \, \text{V} \). Find \( v_2, i, v_3, \) and the resistance \( R_{\text{eq}} = V_s / i \), loading the voltage source.

1.41 For the bridge circuit shown in Fig. P1.39, when the current \( i = 0 \, \text{A} \), we say that the bridge is balanced. Under what condition (find an expression relating \( R_1 \) and \( R_2 \)) will this bridge be balanced?

1.42 For the circuit shown in Fig. P1.42, find \( i_1 \) when (a) \( K = 2 \), (b) \( K = 3 \), and (c) \( K = 4 \).

1.43 The circuit shown in Fig. P1.43 contains a voltage-dependent voltage source as well as a current-dependent current source. Find \( i_1 \) when (a) \( K = -3 \), (b) \( K = -1.5 \), and (c) \( K = 1.5 \).

---

**Fig. P1.37**

**Fig. P1.39**

**Fig. P1.42**

**Fig. P1.43**
1.44 Consider the circuit shown in Fig. P1.44. Find $v$ when (a) $K = 2$, and (b) $K = 4$.

1.45 Consider the circuit shown in Fig. P1.45. Find $i$ when (a) $K = 2$, and (b) $K = 4$.

1.46 Consider the circuit shown in Fig. P1.46. (a) Find the resistance $R_{eq} = v_1/i_1$. (b) Find the voltage $v_2$ in terms of the applied voltage $v_1$.

1.47 Consider the circuit shown in Fig. P1.47. (a) Find the resistance $R_{eq} = v_1/i_1$. (b) Use voltage division to find $v$ in terms of $v_g$. (c) Find the voltage $v_2$ in terms of the applied voltage $v_1$.

1.48 For the circuit shown in Fig. P1.48, suppose that $R = 10 \, \Omega$. Determine (a) $v_s$, and (b) $R_{eq} = v_s/i_s$.

1.49 For the circuit shown in Fig. P1.48, suppose that $R = 8 \, \Omega$. Determine (a) $v_s$, and (b) $R_{eq} = v_s/i_s$. 

Fig. P1.47

Fig. P1.48

Fig. P1.43

Fig. P1.44

Fig. P1.45