SPH 3U0   **Name:**

Practice Problems: Combination Circuits

①

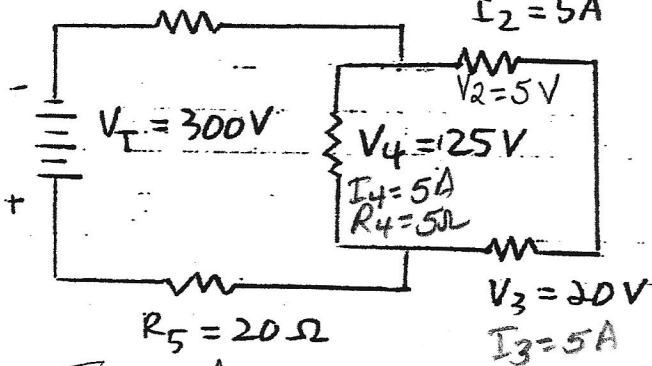$R_1 = \frac{V_1}{I_1} = \frac{75V}{10A} = 7.5\Omega$

$V_1 = 300V - 25V - 200V = 75V$

$I_1 = 10A$

$R_2 = \frac{V_2}{I_2} = 1\Omega$

$I_2 = 5A$

$V_T = 300V$

$V_2 = 5V$

$V_4 = 125V$

$I_4 = 5A$

$R_4 = 5\Omega$

$V_3 = 20V$

$I_3 = 5A$

$R_5 = 20\Omega$

$I_5 = 10A$

$V_5 = (10A)(20\Omega) = 200V$

$R_3 = \frac{V_3}{I_3} = \frac{20V}{5A} = 4\Omega$

$R_T = \frac{V_T}{I_T} = \frac{300V}{10A} = 30\Omega$

$V_T = 300.0V$	$I_T = 10.0A$	$R_T = 30.0\Omega$
$V_1 = 75.0V$	$I_1 = 10.0A$	$R_1 = 7.5\Omega$
$V_2 = 5.0V$	$I_2 = 5.0A$	$R_2 = 1.0\Omega$
$V_3 = 20.0V$	$I_3 = 5.0A$	$R_3 = 4.0\Omega$
$V_4 = 25.0V$	$I_4 = 5.0A$	$R_4 = 5.0\Omega$
$V_5 = 200.0V$	$I_5 = 10.0A$	$R_5 = 20.0\Omega$

②

$R_1 = 12\Omega$ $V_1 = I_1 R_1 = 19.6V$

$I_T = \frac{V_T}{R_T} = \frac{50V}{30.6} = 1.64A$

$V_T = 50V$

$R_2 = 15\Omega$ $V_2 = V_T - V_1 - V_4 = 14.0V$

$R_4 = 10\Omega$

$V_4 = I_4 R_4 = 16.4V$

$R_3 = 20\Omega$
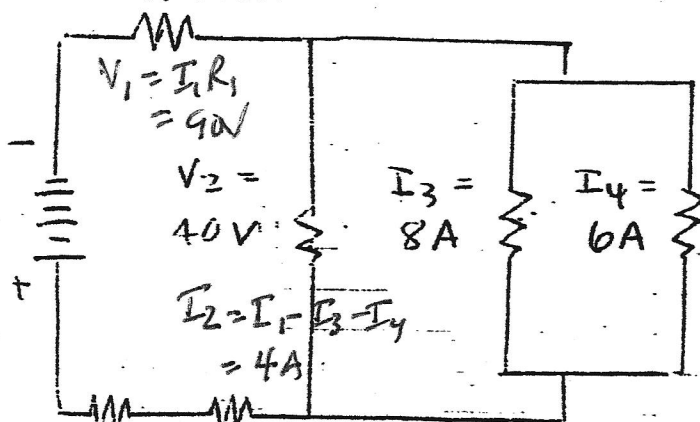
$\frac{1}{R_P} = \frac{1}{15\Omega} + \frac{1}{20\Omega} = \frac{4+3}{60\Omega} = \frac{7}{60\Omega} \rightarrow R_P = 8.57\Omega$

$R_T = R_1 + R_P + R_4$
$= 12\Omega + 8.57\Omega + 10\Omega = 30.6\Omega$
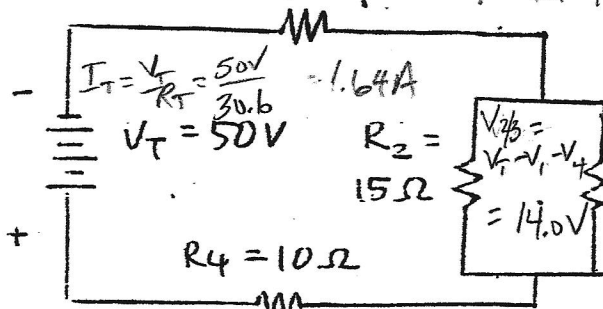
$V_T = 50.0V$	$I_T = 1.64A$	$R_T = 30.6\Omega$
$V_1 = 19.6V$	$I_1 = 1.64A$	$R_1 = 18.0\Omega$
$V_2 = 14.0V$	$I_2 = 0.93A$	$R_2 = 15.0\Omega$
$V_3 = 14.0V$	$I_3 = 0.70A$	$R_3 = 20.0\Omega$
$V_4 = 16.4V$	$I_4 = 1.64A$	$R_4 = 10.0\Omega$

③

$R_1 = 5\Omega$

$I_1 = 18A$

$V_1 = I_1 R_1 = 90V$

$V_2 = 40V$

$I_3 = 8A$

$I_4 = 6A$

$I_2 = I_1 - I_3 - I_4 = 4A$

$V_6 = 63V$ $V_5 = 36V$

$R_T = \frac{V_T}{I_T} = \frac{229V}{18A} = 12.7\Omega$

$V_T = 229.0V$	$I_T = 18.0A$	$R_T = 12.7\Omega$
$V_1 = 90.0V$	$I_1 = 18.0A$	$R_1 = 5.0\Omega$
$V_2 = 40.0V$	$I_2 = 4.0A$	$R_2 = V_2/5\Omega = 10.0\Omega$
$V_3 = 40.0V$	$I_3 = 8.0A$	$R_3 = V_3/I_3 = 5.0\Omega$
$V_4 = 40.0V$	$I_4 = 6.0A$	$R_4 = V_4/I_4 = 6.7\Omega$
$V_5 = 36.0V$	$I_5 = 18.0A$	$R_5 = V_5/I_5 = 2.0\Omega$
$V_6 = 63.0V$	$I_6 = 18.0A$	$R_6 = V_6/I_6 = 3.5\Omega$

$V_T = V_1 + V_{2/3/4} + V_5 + V_6$
$= 90V + 40V + 36V + 63V$
$= 229V$
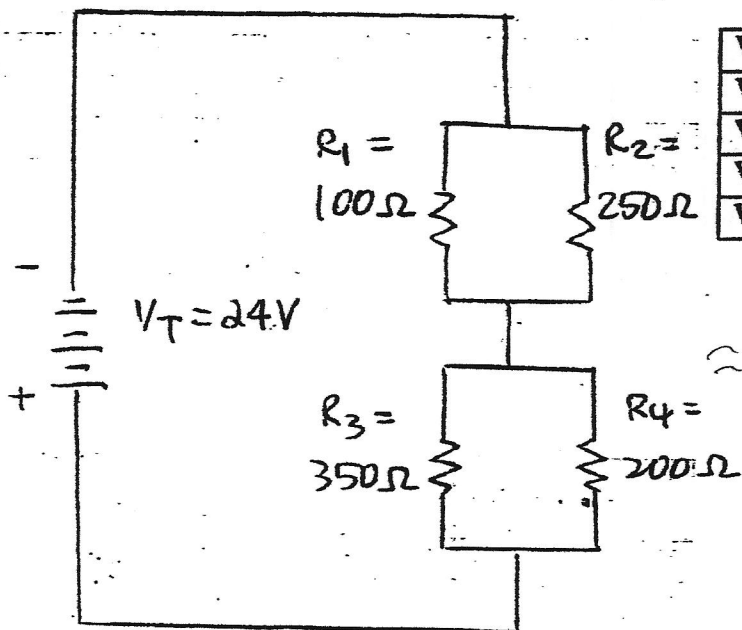
Practice Problems Combining Circuits

④ ———— $I_T = \dfrac{V_T}{R_T} = \dfrac{24.0V}{198.7\Omega}$ $V_{1/2} = I_T R_{P_1}$ $V_{3/4} = I_T R_{P_2}$ $I_1 = \dfrac{V_1}{R_1} = \dfrac{8.627V}{100V}$

$= 0.121A$ $= 8.627V$ $= 15.373V$ $\approx 0.086A$

$V_T =$ 24.0V	$I_T =$ 0.12 A	$R_T =$ 198.7Ω
$V_1 =$ 8.6V	$I_1 =$ 0.09 A	$R_1 =$ 100.0Ω
$V_2 =$ 8.6V	$I_2 =$ 0.03 A	$R_2 =$ 250.0Ω
$V_3 =$ 15.4V	$I_3 =$ 0.04A	$R_3 =$ 350.0Ω
$V_4 =$ 15.4V	$I_4 =$ 0.08A	$R_4 =$ 200.0Ω

$R_T = R_{P_1} + R_{P_2} = 198.7\Omega$
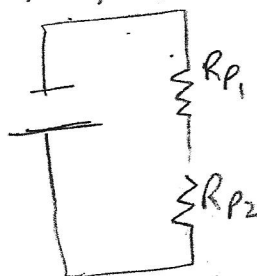
$\dfrac{1}{R_{P_1}} = \dfrac{1}{100.0\Omega} + \dfrac{1}{250\Omega}$
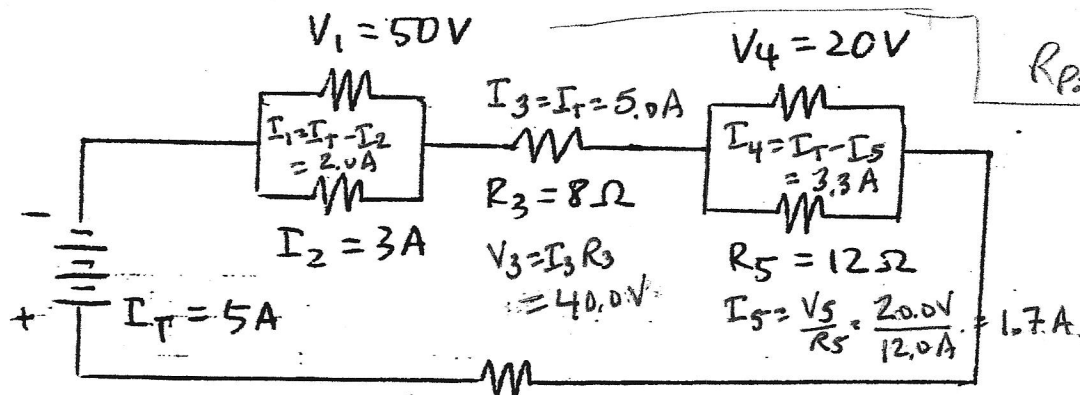
$= \dfrac{5+2}{500.0\Omega}$

$R_{P_1} = 71.4\Omega$

$\dfrac{1}{R_{P_2}} = \dfrac{1}{350.0\Omega} + \dfrac{1}{200.0\Omega}$

$= \dfrac{2+3.5}{700.0\Omega}$

$R_{P_2} = 127.3\Omega$

⑤

$V_1 = 50V$ $V_4 = 20V$

$I_1 = I_T - I_2 = 2.0A$ $I_3 = I_T = 5.0A$ $I_4 = I_T - I_5 = 3.3A$

$R_3 = 8\Omega$

$I_2 = 3A$ $V_3 = I_3 R_3 = 40.0V$ $R_5 = 12\Omega$

$I_T = 5A$ $I_5 = \dfrac{V_5}{R_5} = \dfrac{20.0V}{12.0A} \approx 1.7A$

$R_6 = 10\Omega$

$I_6 = I_T = 5.0A$

$V_6 = I_6 R_6 = 50.0V$

$V_T =$ 160.0V	$I_T =$ 5.0A	$R_T =$ 32.0Ω
$V_1 =$ 50.0V	$I_1 =$ 2.0A	$R_1 =$ 25.0Ω
$V_2 =$ 50.0V	$I_2 =$ 3.0A	$R_2 =$ 16.7Ω
$V_3 =$ 40.0V	$I_3 =$ 5.0 A	$R_3 =$ 8.0Ω
$V_4 =$ 20.0V	$I_4 =$ 3.3A	$R_4 =$ 6.0Ω
$V_5 =$ 20.0V	$I_5 =$ 1.7A	$R_5 =$ 12.0Ω
$V_6 =$ 50.0V	$I_6 =$ 5.0A	$R_6 =$ 10.0Ω

$V_T = V_{1/2} + V_3 + V_{4/5} + V_6$

$= 50.0V + 40.0V + 20.0 + 50.0V$

$= 160.0V$

$R_T = \dfrac{V_T}{I_T} = \dfrac{160.0V}{5.0A} = 32.0\Omega$

$R_1 = \dfrac{V_1}{I_1} = 25.0\Omega$

$R_2 = \dfrac{V_2}{I_2} = \dfrac{50.0V}{3.0A} = 16.7\Omega$

$R_4 = \dfrac{V_4}{I_4} = \dfrac{20.0V}{3.333A} = 6.0\Omega$