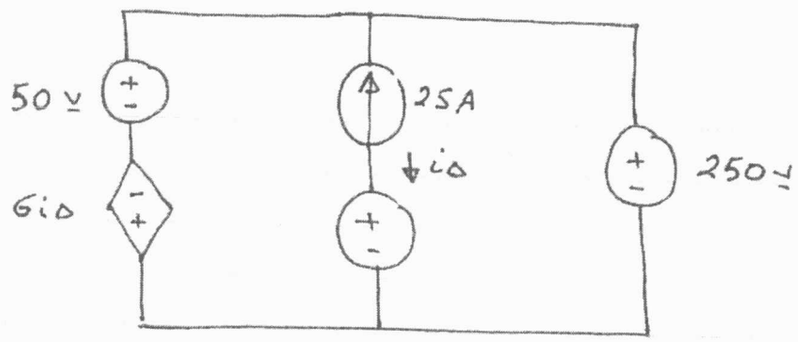
2.7

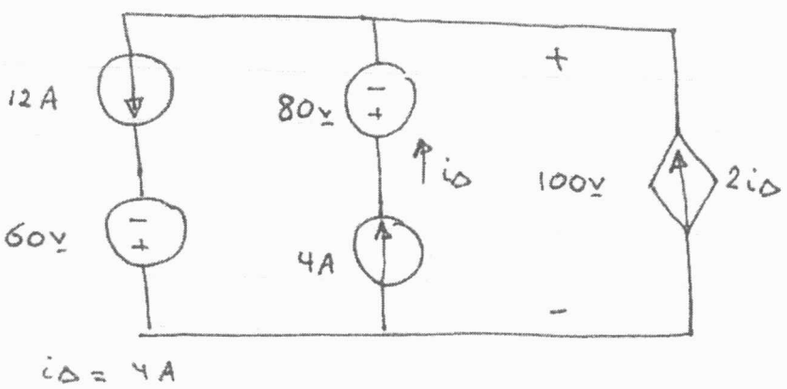


$i_\Delta = -25A$, $\therefore 6i_\Delta = -150$ V

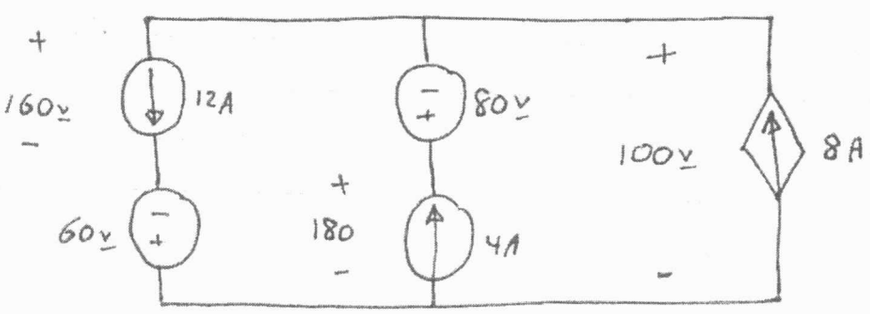
Since $50 - (-150) \neq 250$

$\therefore$ The connection is invalid.

2.8



$i_\Delta = 4A$



$P_{12A} = (160)(12) = 1920\ \omega$ absorb

$P_{60v} = (60)(12) = 720\ \omega$ supply

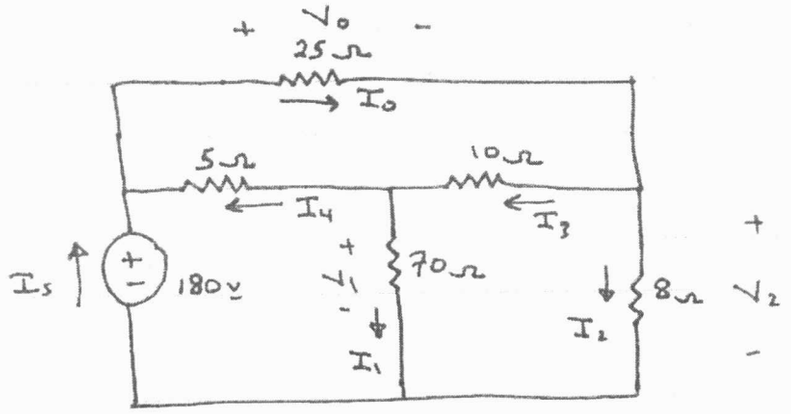
$P_{80v} = (80)(4) = 320\ \omega$ absorb

$P_{4A} = (4)(180) = 720\ \omega$ supply

$P_{2i0} = (8)(100) = 800\ \omega$ supply

Σ Power supply = Σ Power absorb

2.21



Since $I_o = 4A$, $V_o = 100v$

$V_2 = -V_o + 180 = 80v$

$I_2 = \frac{V_2}{8} = 10A$

$I_3 = I_o - I_2 = -6A$

$V_1 = -10 I_3 + V_2 = 140v$

$I_1 = \frac{V_1}{70} = 2A$

$I_4 = I_3 - I_1 = -8A$

$I_s = I_o - I_4 = 12A$

$P_{5\Omega} = (8)^2 \cdot 5 = 320\ W$

$P_{25\Omega} = (4)^2 \cdot 25 = 400\ W$

$P_{70\Omega} = (2)^2 \cdot 70 = 280\ W$

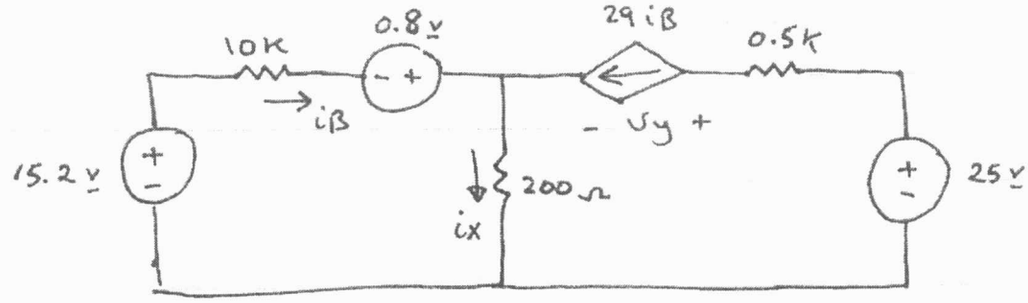
$P_{10\Omega} = (6)^2 \cdot 10 = 360\ W$

$P_{8\Omega} = (10)^2 \cdot 8 = 800\ W$

$P_{180V} = (180)(12) = 2160$

$$\Sigma P_{dissipated} = \Sigma P_{power\ supply}$$

2.27



$i_X = 30\, i_B$

$i_B = \dfrac{15.2 + 0.8}{16K} = 1mA$

$V_y = -(0.5K)(29\, i_B) + 25 - (0.2K)(30\, i_B) = 4.5\ V$

$P_{15.2V} = (15.2)(1mA) = 15.2\ mW$ supply

$P_{0.8V} = (0.8)(1mA) = 0.8\ mW$ supply

$P_{25V} = (25)(29mA) = 725\ mW$ supply

$P_{29i_B} = (29mA)(4.5) = 130.5\ mW$ absorb

$P_{10K} = (10K)(1mA)^2 = 10\ mW$ dissipated

$P_{200\Omega} = (30mA)^2(200) = 180\ mW$ dissipated

$P_{0.5K} = (29mA)^2(500) = 420.5\ mW$ dissipated

$\sum$ power supplied = $\sum$ power absorbed + $\sum$ power dissipated

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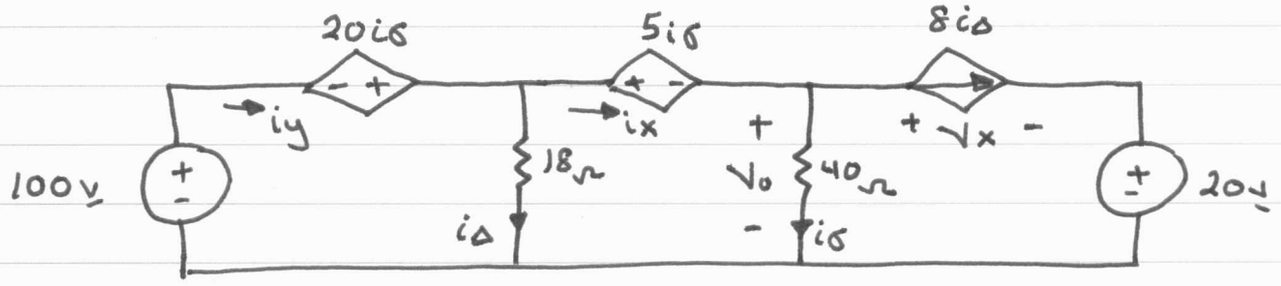
2.30



$100 = -20i_6 + 18i_\Delta$

$0 = 5i_6 + 40i_6 - 18i_\Delta$

$\therefore\ i_6 = 4A$ and $i_\Delta = 10A$

$V_o = 40i_6 = 160\ V$, $V_x = V_o - 20 = 140\ V$

$i_x = i_6 + 8i_\Delta = 84\ A$

$i_y = i_x + i_\Delta = 94\ A$

$P_{100V} = (100)(i_y) = 9400\ W$ supply

$P_{20i_6} = (20i_6)(i_y) = 7520\ W$ supply

$P_{20V} = (20)(8i_\Delta) = 1600\ W$ absorb

$P_{8i_D} = (8i_D)(4x) = 11200$ w absorb

$P_{5i_6} = (5i_6)(ix) = 1680$ w absorb

$P_{18_\Omega} = (18)(i_D)^2 = 1800$ w dissipated

$P_{40_\Omega} = (40)(i_6)^2 = 640$ w dissipated

$\sum$ power supplied = $\sum$ power absorbed + $\sum$ power dissipated

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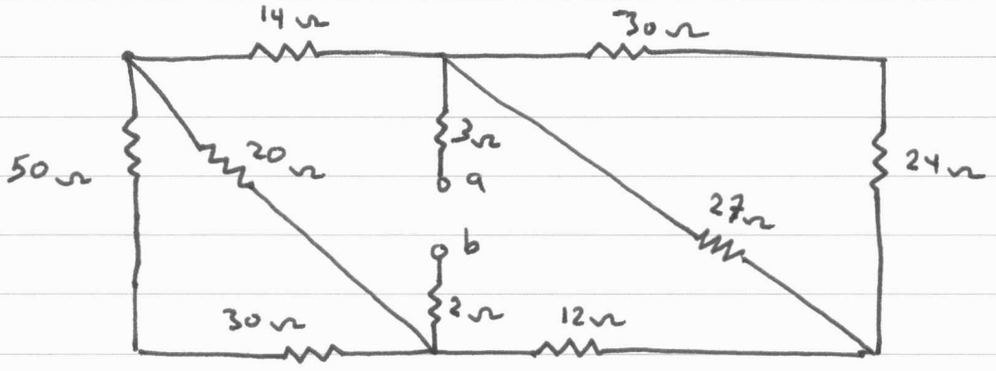
Ch. 3 Homework Solutions EE 231

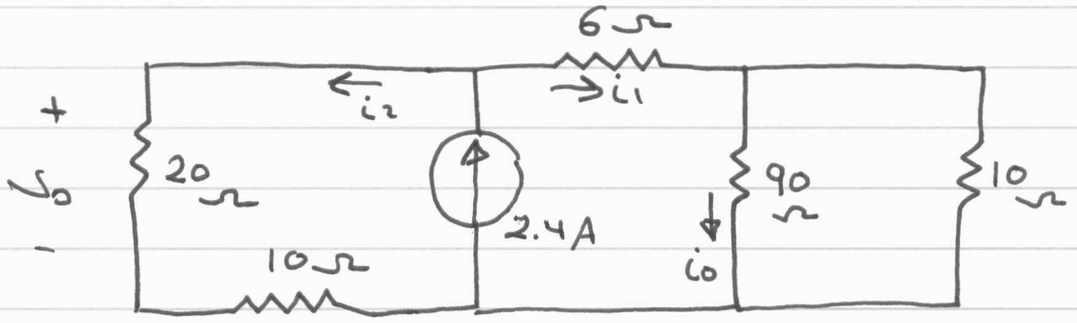
3.6 c



$$R_{eq} = 2+3+\left[\left(\left(30+24\right)\|27\right)+12\right]\|\left(14+\left(50+30\right)\|20\right)$$

$R_{eq} = 20\ \Omega$

3.11



$$i_1 = \frac{(20+10)}{(20+10)+(6+90\|10)}(2.4A)$$

$i_1 = 1.6\ A$

$i_2 = 2.4\ A - 1.6\ A = 0.8\ A$

$i_o = \left(\frac{10}{10+90}\right)(1.6A) = 0.16A$

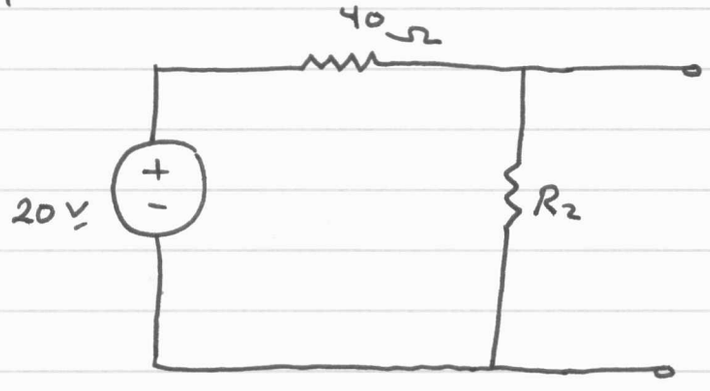
$v_o = 20\, i_2 = 16\ V$

$v_{2.4A} = (20+10)\, i_2 = 24\ V$

$p_{2.4A} = (24)(2.4) = 57.6\ w$ (supply)

$p_{6\Omega} = 6\, i_1^2 = 15.36\ w$ (dissipate)

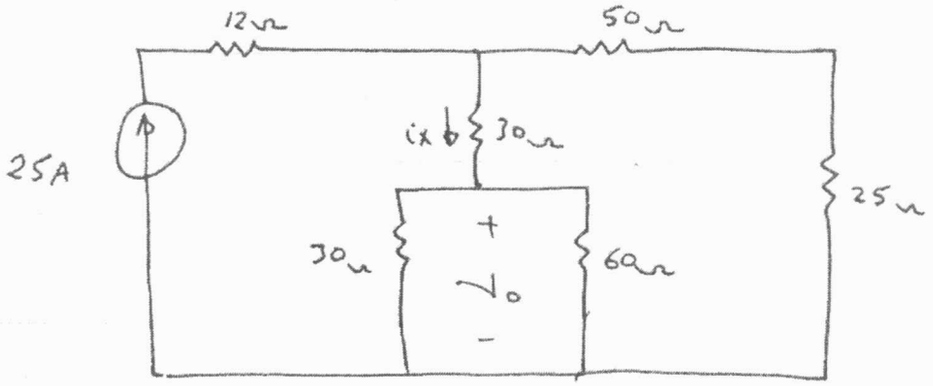
3.14



$$4 = \frac{R_2}{R_2+40}(20) \longrightarrow R_2 = 10\ \Omega$$

$$3 = \frac{R_2\|R_L}{R_2\|R_L+40}(20) \longrightarrow R_L = 24\ \Omega$$

3.25

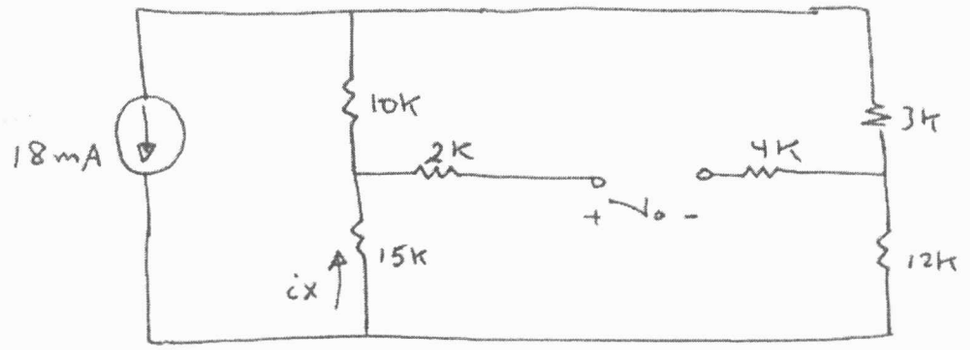


$$i_x = 25 \frac{75}{75 + 30 + 60 \| 30} = 15\,A$$

$$v_o = i_x (30 \| 60) = 300\,V$$

$$v_s = (12)(25) + 30 i_x + v_o = 1050\,V$$

3.26

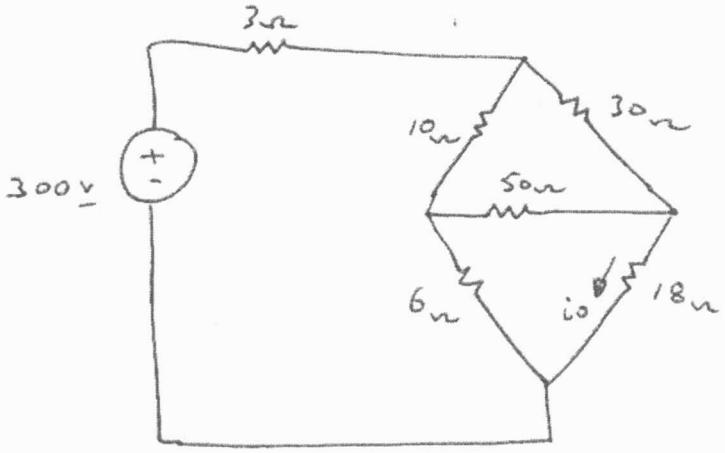


$$i_x = (18mA) \frac{15}{15 + 25} = 6.75\,mA$$

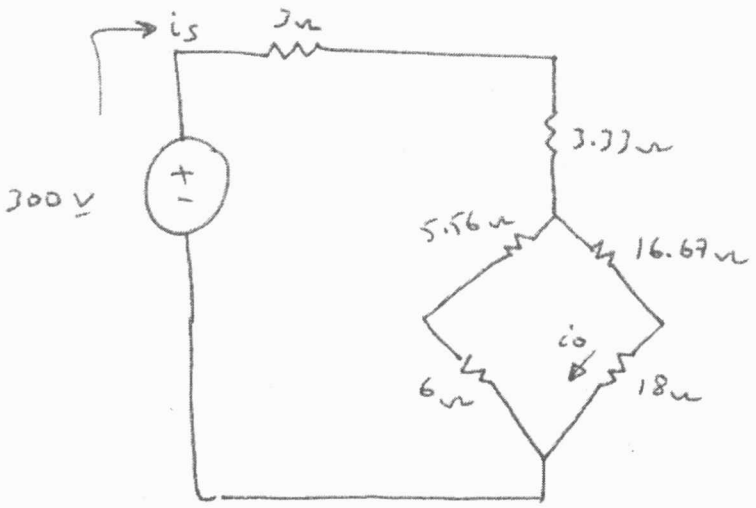
$$v_o = -(15K)\, i_x + (12K)(18 - i_x)$$

$$v_o = 33.75\,V$$

3.49



Δ - Y Transformation

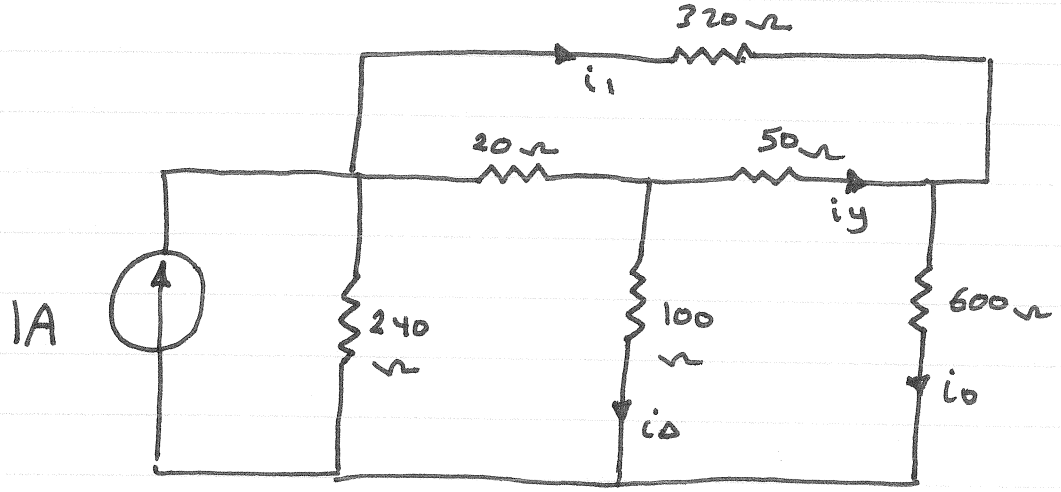


$$i_s = \frac{300}{3 + 3.33 + (5.56+6) \,\|\, (18+16.67)} = 20\ A$$

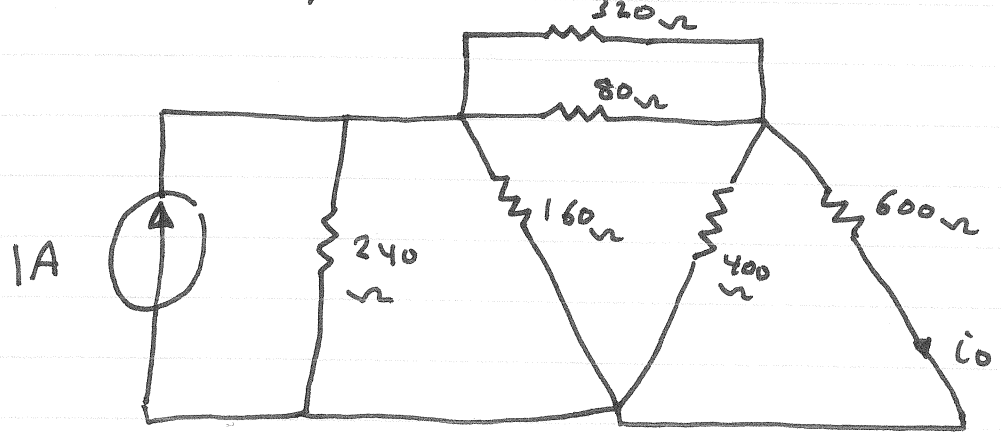
$$i_o = 20\ \frac{11.56}{11.56 + 34.67} = 5\ A$$

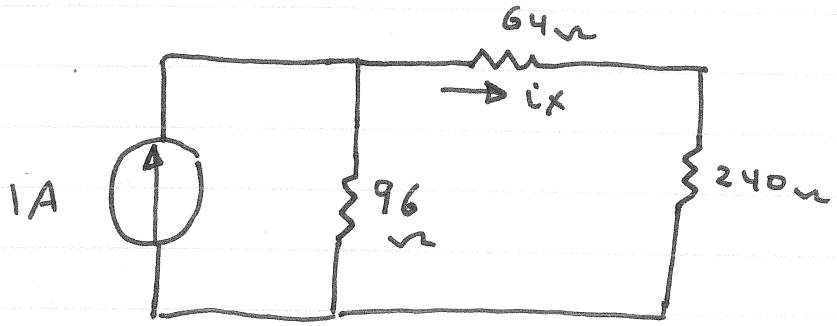
$$P_{18\Omega} = (5)^2 \cdot 18 = 450 \quad \text{dissipated}$$

3.54



Y-Δ Transformation





$$i_x = 1A \frac{96}{96+304} = 0.24\,A$$

$$i_1 = \frac{80}{80+320} i_x = 0.048\,A$$

$$i_o = \frac{400}{400+600} i_x = 0.096\,A$$

$$i_y = i_o - i_1 = 0.048\,A$$

$$i_\Delta = \frac{50 i_y + 600 i_o}{100} = 0.6\,A$$