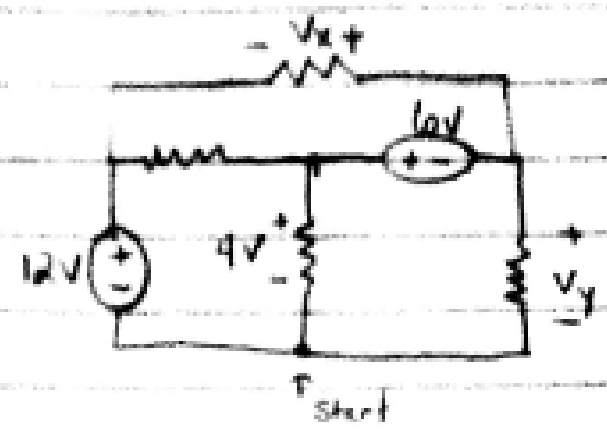
Exam I : Monday June 9
up through Node Analysis

5/28/19

2:



KVL: $-4 + 6 + V_y = 0$

$V_y = -2V$

KVL_2: $-12 - V_x + V_y = 0$

$-12 - V_x - 2 = 0$ $\quad V_x = -14V$

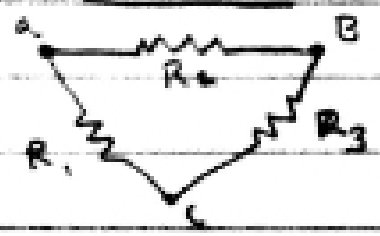
$V_x = -14V \quad V_y = -2V$

Resistors in Series carry the same current and Different Voltages

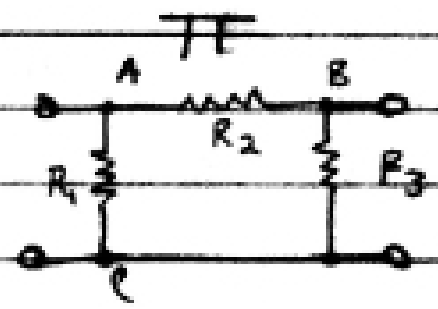
Resistors in Parallel carry the same Voltage and Different Currents

F. Delta To Y Transformation

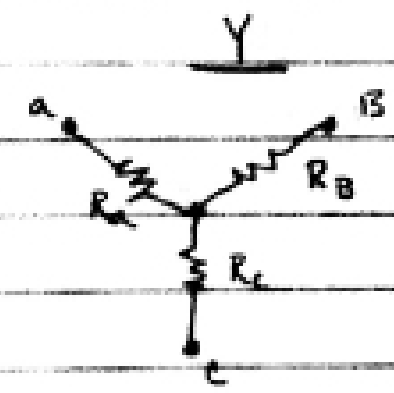
1. Delta - (or P.) Network

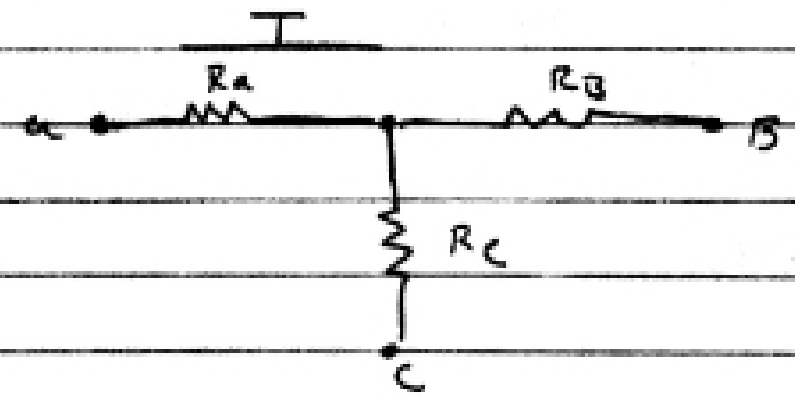


Rearranged

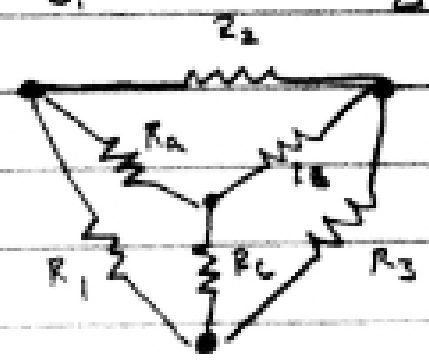


2. Y (W_{ye}) - Tee Network





3. Δ-Y



$R_{ac} = R_1 \,||\, (R_2 + R_3) = R_A + R_C$

$$R_A = \frac{R_1 R_2}{R_1 + R_2 + R_3}$$

$$R_B = \frac{R_2 R_3}{R_1 + R_2 + R_3}$$

$$R_C = \frac{R_1 R_3}{R_1 + R_2 + R_3}$$

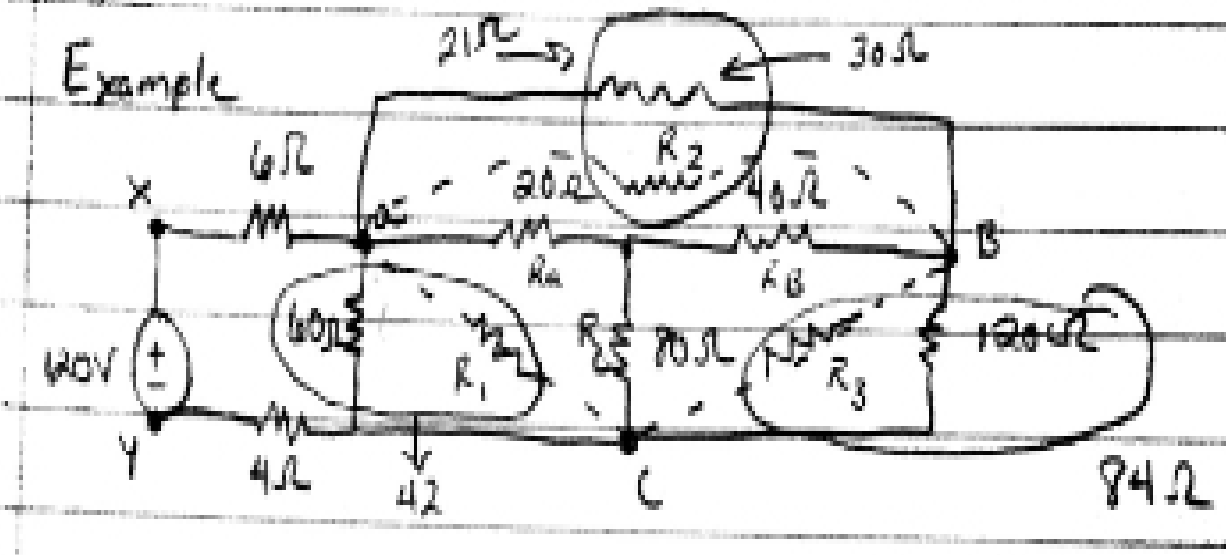
4. Y-D

$$R_1 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_B}$$

$$R_2 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_C}$$

$$R_3 = \frac{R_A R_B + R_B R_C + R_A R_C}{R_A}$$

Example



$$R_1 = \frac{20(40) + 20(80) + 80(40)}{40\Omega} = 140\Omega$$

$$R_2 = \frac{20(40) + 20(80) + 80(40)}{80\Omega} = 70\Omega$$

$$R_3 = \frac{20(40) + 20(80) + 80(40)}{20\Omega} = 280\Omega$$

$30 // 70 = \frac{2100}{100} = 21\Omega$

$140 // 60 = \frac{(140)(60)}{200} = 42\Omega$

$280 // 120 = \frac{(120)280}{400} = 84\Omega$

Next 84 series 84 = 105Ω

$105 // 42 = \frac{105(42}{147} = 30\Omega$

6Ω series with 30Ω and 4Ω

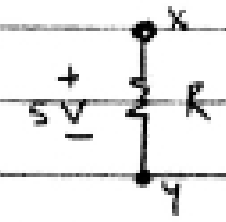
$R_{xy} = 40\Omega$

HW 2.105

Chapter 3

A. Basic Nodal Analysis

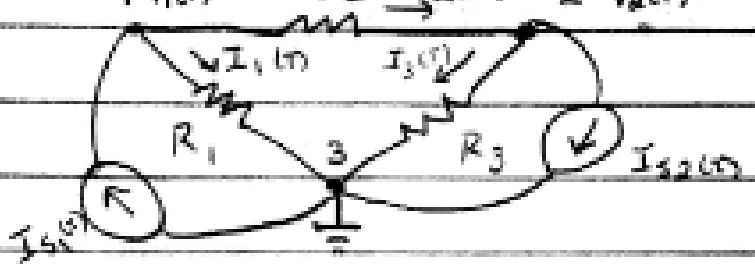
1. Use KCL
2. Determine node voltages
3. Voltage - potential between Two points



Y as reference - Point X is 5V more Positive Than Point Y

X as ref - Point Y is 5V more Negative than Point X

4. $\perp$ = Reference



$I = i$

$V_3 = 0$

@ 1: + = i going out

$-I_{s1}(t) + I_1(t) + i_2(t) = 0$

$I_1(t) = \frac{V_1 - V_3}{R_1} = \frac{V_1}{R_1}$

$I_2(t) = \frac{V_1 - V_2}{R_2}$

① $\boxed{-I_{s1}(t) + \frac{V_1}{R_1} + \frac{V_1 - V_2}{R_2} = 0}$

@ 2: $-i_2(t) + i_3(t) + i_{s2}(t)$

$i_3(t) = \frac{V_2(t) - V_3(t)}{R_3} = \frac{V_2(t)}{R_3}$

$-\left(\frac{V_1 - V_2}{R_2}\right) + \frac{V_2}{R_3} + i_{s2} = 0$

2 Equations 2 unknowns

②

$\boxed{\frac{V_2 - V_1}{R_2} + \frac{V_2}{R_3} + i_{s2} = 0}$

$\frac{V_1}{R_1} + \frac{V_1}{R_2} - \frac{V_2}{R_2} = i_{s1}(t)$

$\frac{V_2}{R_2} - \frac{V_1}{R_2} + \frac{V_2}{R_3} = -i_{s2}$

A matrix B matrix = C matrix

$$\begin{bmatrix} \left(\frac{1}{R_1} + \frac{1}{R_2}\right) & -\frac{1}{R_2} \\ -\frac{1}{R_2} & \left(\frac{1}{R_2} + \frac{1}{R_3}\right) \end{bmatrix} \begin{bmatrix} V_1(t) \\ V_2(t) \end{bmatrix} = \begin{bmatrix} i_{s1}(t) \\ -i_{s2}(t) \end{bmatrix}$$

A B = C