1. a) $-I_{1A} + I_{R_1} + I_{R_2} = 0$

$-I_{R_2} + I_{R_3} + I_{1A} = 0$

$-1A + \dfrac{U_1}{10\Omega} + \dfrac{U_1 - U_2}{20\Omega} = 0$

$-\dfrac{U_1 + U_2}{20\Omega} + \dfrac{U_2}{50\Omega} + 1A = 0$

$-20 + 2U_1 + U_1 - U_2 = 0$

$5U_2 - 5U_1 + 2U_2 + 100 = 0$

$-20 + 3U_1 - U_2 = 0$

$7U_2 - 5U_1 + 100 = 0$

~~$7U_2 + 100 - 15U_1$~~ $-140 + 21U_1 - 5U_1 + 100 = 0$

$16U_1 = 40$

$U_1 = 2.5\ V$

$-20 + 7.5 = U_2$ $U_2 = 12.5\ V$

$R_{y} = \dfrac{1}{\frac{1}{10} + \frac{1}{70}} = \dfrac{1}{\frac{7}{70} + \frac{1}{70}} = \dfrac{70}{8} = \dfrac{35}{4}\ \Omega$

$U_1 = 35/4\ V$

$I_{R_{23}} = \dfrac{10}{80} = \dfrac{1}{8}$ $U_2 = \frac{1}{8} \times 50 = \dfrac{25}{4}\ V$

$R_{y} = \dfrac{1}{\frac{1}{50} + \frac{1}{30}} = \dfrac{150}{8} = \dfrac{75}{4}\ \Omega$ $U_2 = \dfrac{75}{4}\ V$

$I_{R_{12}} = \dfrac{50}{80} = \dfrac{5}{8}$ $U_1 = \frac{5}{8} \times 10 = \dfrac{25}{4}\ V$

$U_1 = \dfrac{35}{4} - \dfrac{25}{4} = \dfrac{40}{4} = 2.5$ $U_c = \dfrac{75}{4} - \dfrac{25}{4} = 12.5$

b) $\frac{1}{6} - I_{e_2} + \frac{1}{7} I_{e_5} = 0$

$\frac{V_1}{60} - I_{10k} + I_{R_2} + I_{R_5} = 0$

$\frac{V_1 - 1}{10} - 10V_2 + \frac{V_1}{20} + \frac{V_1 - 10 - V_2}{105} = 0$

$\frac{V_2 + 10 - V_1}{105} + \frac{V_2}{60} = 0$

$42V_1 - 42 - 42000V_2 + 21V_1 + 4V_1 - 40 - 4V_2 = 0$

$4V_2 + 40 - 4V_1 + 7V_2 = 0$

$67V_1 - 42 0 + V_2 - 82 = 0$

$-4V_1 + 11V_2 + 40 = 0$

$\begin{bmatrix} 67 & -42 \\ -4 & 11 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 82 \\ 40 \end{bmatrix}$

$\begin{bmatrix} 67 & -4204 & | & 82 \\ -4 & 11 & | & 40 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & | & 10.40 \\ 0 & 1 & | & 0.146 \end{bmatrix}$

$V_1 = 10.4 \qquad V_2 = 0.146$

2. a) $$R_{eq} = \frac{(R_1 (R_2 + R_3) \quad \overset{x R_T}{)}}{R_T + R_1 + R_2 + R_3}$$

$$V_b \quad \frac{R_1 + R_2 + R_T + R_3}{(R_1 + R_2)(R_T + R_3)}$$