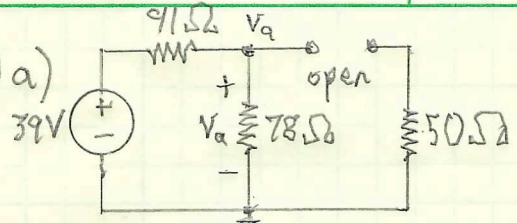
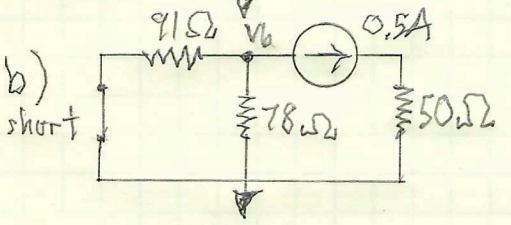
1) a)



Voltage division: $V_a = \frac{78\Omega}{78\Omega+91\Omega} 39V = \underline{18V}$

b)



$91\Omega \| 78\Omega = 42\Omega$

$V_b = -(0.5A)(42\Omega) = \underline{-21V}$

c) $V_c = V_a + V_b = \underline{-3V}$ To check, could use nodal analysis.

$\Rightarrow \frac{V_c-39}{91} + \frac{V_c}{78} + 0.5 = 0 \Rightarrow \left(\frac{1}{91}+\frac{1}{78}\right)V_c = -0.5 + \frac{39}{91} \Rightarrow V_c = -3V$

2) a) Deactivate source, 105Ω shorted out. $\Rightarrow R_N = \underline{70\Omega}$

b) With short across a & b, $I_{sc} = I_N = 1A + \frac{35V}{70\Omega} = \underline{1.5\,A}$

c) $R_L = R_N = 70\Omega$. Power $= I^2 R_L = \left(\frac{1.5A}{2}\right)^2 70\Omega = \underline{39.375\,W}$

3) a) $\underline{v_\Delta = R_2 i_2}$

b) $i_1 + \alpha v_\Delta = i_2 \Rightarrow i_1 + \alpha R_2 i_2 = i_2 \Rightarrow \underline{i_1 + (\alpha R_2 - 1) i_2 = 0}$

c) $\underline{i_1 R_1 + i_2 R_2 + V_s = 0}$

d) $\underline{v_a = -i_1 R_1}$, e) $\underline{v_a = i_2 R_2 + V_s}$

4) a) $\underline{i_\Delta = \frac{v_a}{45\Omega}}$

b) $i_1 = \frac{v_a + 9 i_\Delta - 84V}{12\Omega} = \frac{v_a + 9\left(\frac{v_a}{45}\right) - 84}{12} = \underline{\left(\frac{1}{12}+\frac{1}{60}\right)v_a - 7}$

c) $\underline{\left(\frac{1}{12}+\frac{1}{60}\right)v_a - 7 + \frac{v_a}{45} + \frac{v_a}{90} - 5 = 0}$

d) $\left(\frac{1}{12}+\frac{1}{60}+\frac{1}{45}+\frac{1}{90}\right)v_a = 12 \Rightarrow \underline{v_a = 90V}$

5) a) $v_p = \underline{0.2V}$ (by inspection), b) $v_n = v_p = \underline{0.2V}$

c) $\frac{v_n - (-0.2V)}{10k} + \frac{v_n - v_o}{50k} = 0 = \underline{\frac{0.2+0.2}{10k} + \frac{0.2-v_o}{50k}}$

d) $v_o = 5(0.2+0.2) + 0.2 = \underline{2.2V}$