P.18.19 $g_{11} = \left.\frac{I_1}{V_1}\right|_{I_2=0}$ $\quad g_{21} = \left.\frac{V_2}{V_1}\right|_{I_2=0}$

$V_1 = 200\, I_1 + 800\, I_1 = 1000 I_1 \quad \therefore g_{11} = 10^{-3}\ S$

$V_- = \frac{1000}{1500} V_2 = V_+ \qquad V_+ = \frac{800}{1000} V_1$

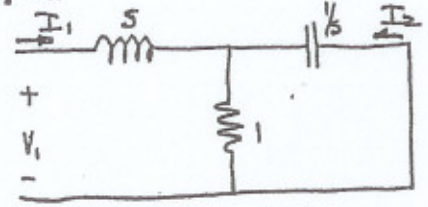
$\therefore \frac{1000}{1500} V_2 = \frac{800}{1000} V_1; \quad \therefore g_{21} = 1.2$

$g_{12} = \left.\frac{I_1}{I_2}\right|_{V_1=0}; \quad g_{21} = \left.\frac{I_2}{I_2}\right|_{V_1=0}$

$I_1 = 0; \quad \therefore g_{12} = 0$

Also, $V_o = 0; \quad \therefore g_{22} = \frac{V_2}{I_2} = 40\,\Omega$

P 18.20 $V_2 = 0$:



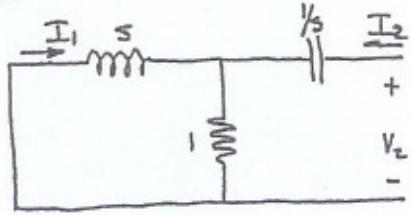
$\frac{V_1}{I_1} = s + |1\|(1/s)| = \frac{s^2+s+1}{s+1}$

$\therefore y_{11} = \left.\frac{V_1}{I_1}\right|_{V_2=0} = \frac{s+1}{s^2+s+1}$

$I_2 = \frac{-1}{1+(1/s)} I_1 = \frac{-s}{s+1} I_1 = \frac{-s}{s+1}\left(\frac{s+1}{s^2+s+1}\right) V_1$

$\therefore y_{21} = \left.\frac{I_2}{V_1}\right|_{V_2=0} = \frac{-s}{s^2+s+1}$

$V_1 = 0$:



$\frac{V_2}{I_2} = (1/s) + 1\|s = \frac{1}{s} + \frac{s}{s+1} = \frac{s^2+s+1}{s(s+1)}$

$\therefore y_{22} = \left.\frac{I_2}{V_2}\right|_{V_1=0} = \frac{s(s+1)}{s^2+s+1}$

$I_1 = \frac{-1}{s\,\|\,1} I_2 = \frac{-1}{s\,\|\,1}\left[\frac{s(s+1)}{s^2\,|\,s\,|\,1}\right] V_2$

$\therefore y_{12} = \left.\frac{I_1}{V_2}\right|_{V_1=0} = \frac{-s}{s^2+s+1}$

#18.30 from Table 18.2

$I_2 = \frac{y_{21} V_s}{1 + y_{22} Z_L + y_{11} Z_s + \Delta y\, Z_s Z_L} = 0.0714\ A$

$P_{R_L} = \frac{1}{2} I^2 R_L = 0.225\ W$

$\frac{I_1}{I_2} = \frac{y_{21}}{y_{11} + \Delta y\, Z_L} = -14.294$

$\Rightarrow I_1 = -0.005\ A$

$P_{15} = \frac{1}{2} IV = \frac{1}{2}(1)(-0.005) = -0.0025\ W$

$\frac{P_o}{P_i} = 102$

HW 13

1/2

P 16.38 $a'_{11} = -\dfrac{\Delta h}{h_{21}} = \dfrac{-0.02}{-0.1} = 0.2$

$a'_{12} = -\dfrac{h_{11}}{h_{21}} = \dfrac{-150}{-0.1} = 1500$

$a'_{21} = -\dfrac{h_{22}}{h_{21}} = \dfrac{-10^{-4}}{-0.1} = 10^{-3}$

$a'_{22} = -\dfrac{1}{h_{21}} = \dfrac{-1}{-0.1} = 10$

$a''_{11} = \dfrac{1}{g_{21}} = \dfrac{1}{20} = 0.05$

$a''_{12} = \dfrac{g_{22}}{g_{21}} = \dfrac{24 \times 10^3}{20} = 1200$

$a''_{21} = \dfrac{g_{11}}{g_{21}} = \dfrac{0.01}{20} = 5 \times 10^{-4}$

$a''_{22} = \dfrac{\Delta g}{g_{21}} = \dfrac{320}{20} = 16$

$a_{11} = a'_{11}a''_{11} + a'_{12}a''_{21} = (0.2)(0.05) + (1500)(5 \times 10^{-4}) = 0.76$

$a_{12} = a'_{11}a''_{12} + a'_{12}a''_{22} = (0.2)(1200) + (1500)(16) = 24{,}240$

$a_{21} = a'_{21}a''_{11} + a'_{22}a''_{21} = (10^{-3})(0.05) + (10)(5 \times 10^{-4}) = 5.1 \times 10^{-3}$

$a_{22} = a'_{21}a''_{12} + a'_{22}a''_{22} = (10^{-3})(1200) + (10)(16) = 161.2$

$$V_2 = \frac{Z_L V_g}{(a_{11} + a_{21}Z_g)Z_L + a_{12} + a_{22}Z_g}$$

$$= \frac{(1000)(109.5)}{[0.76 + (5.1 \times 10^{-3})(20)(1000)] + 24{,}240 + (161.2)(20)} = 3.87 \text{ V}$$

HW 13

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