EE202 **HOMEWORK PROBLEMS** **SPRING 09**

DUE MONDAY APRIL 27

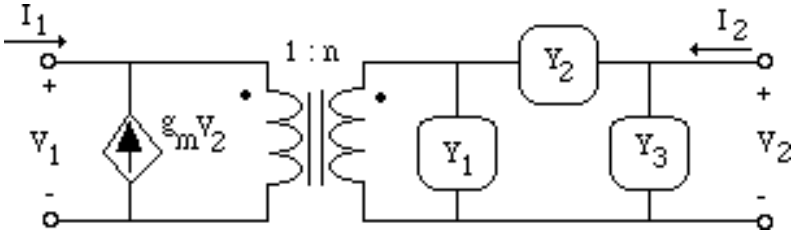
73. Numbers are probably NOT nice.

(a) Find the y-parameters of the circuit below.

(b) Find the z-parameters of the circuit below

if $g_m = 2$ [S], $n = 2$, $Y_1 = Y_2 = 0.2$ [S], Y_3=0.5s [S].

(c) If the secondary is terminated in a 10 Ω resistor and the primary is attached to a current source pointing up, find the impulse response $v_2(t)$.



74. The 2-port configuration below has the indicated y-parameters in S. Suppose $\frac{V_1}{V_s} = \frac{2}{s+6}$ and

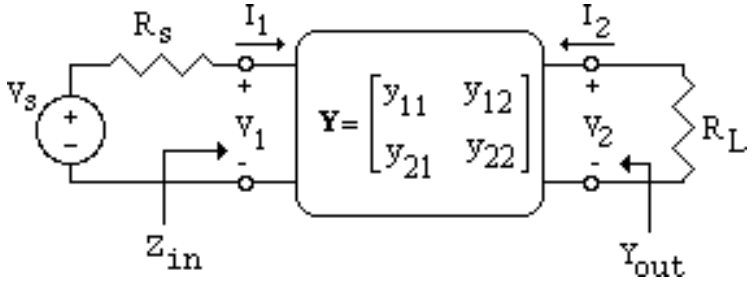
$R_s = 1\ \Omega$.

(a) Find y_{11} if Ω, $y_{21} = -1$ S, $y_{12} = 0.75$ S, $y_{22} = 0.25$ S, and $R_L = 8\ \Omega$.

(b) Find $Y_{out}(s)$.

(c) Determine the voltage gain $G_v = \frac{V_2}{V_s}$.

(d) If $v_s(t) = 30u(t)$ V, find $v_2(t)$ and the power, $p_L(t)$, absorbed by R_L.



75. In a laboratory, you are asked to determine the admittance parameters of a circuit. You decide to short circuit port-2, place a unit step current source at port 1, and measure the port voltage, $v_1(t) = (1 - e^{-4t})u(t)$ V, and the port-2 current, $i_2(t) = -e^{-3t}u(t)$ A. Knowing that this is sufficient to

determine at most 2 of the parameters, you then break the short circuit and terminate port-2 with a 1 Ω resistor and measure the new step responses as: $v_1(t) = (1 - e^{-4t} + te^{-4t})u(t)$ V and $i_2(t) = -e^{-7t}u(t)$ A.

(a) Compute the y-parameters of the 2-port.

(b) If the port-2 is terminated in a 1 Ω resistor, find the input impedance seen at port-1.

(c) If the port-2 is terminated in a 1 Ω resistor and driven at port-1 by a current source, $i_1(t)$ = cos(4t)u(t) A, compute the steady state magnitude of the gain, $|V_2/I_1|$.

76. The stages in the circuit below have z-parameter matrices

$$Z_1 = \begin{bmatrix} 2 & 0 \\ -10^3 & 20 \end{bmatrix} \text{k}\Omega \text{ and } Z_2 = \begin{bmatrix} 62.582 & 1.2075 \\ 63.75 & 1.25 \end{bmatrix} \text{k}\Omega$$

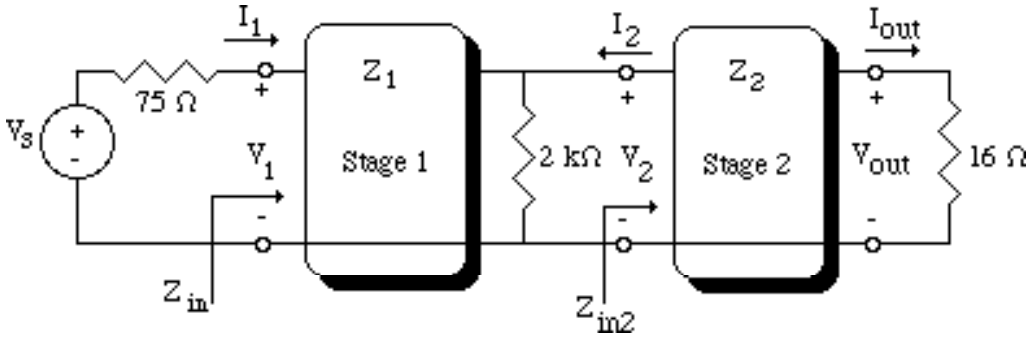
respectively.

(a) Compute the input impedances, Z_{in2} and Z_{in}.

(b) Compute the voltage gain, V_{out}/V_s.

(c) Compute the power gain, $P_{gain} = \dfrac{v_{out} i_{out}}{v_1 i_1}$.

(d) CHECK the matching of the load and output impedance of the amplifier circuit.



DUE FRIDAY MAY 1

77-78. In this problem you are to design an amplifier circuit represented by the doubly terminated equivalent circuit shown below. This means you will be given certain amplifier specifications that will allow you to determine the parameters of the amplifier circuit.

Amplifier Specifications: $R_L = 2\ \Omega$ and $R_s = 40\ \Omega$.

(i) When I_1 is zero, the ratio $\frac{V_1}{V_2} = 0$, when a source is applied to port 2;

(ii) There must be maximum power transfer from the amplifier output to the load under the condition that $Z_{out}(s) = 800\ \Omega$.

(iii) $\frac{V_1}{V_s} = \frac{25}{26}$

(iv) The voltage gain $\frac{V_2}{V_1} = -100$.

Given the above amplifier specifications:

(a) Compute h_{12}.

(b) Compute Y_{out}, h_{22}, and the turns ratio a.

(c) Compute h_{11}.

(d) Compute the input impedance Z_{in}

(e) Compue h_{21}

(f) Compute the ratio of the power delivered to the load to the power DELIVERED to R_L.