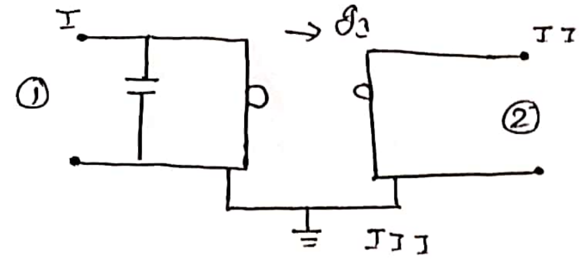
problem 2:

(a)



$$Y_C = \begin{bmatrix} sC & 0 & -sC \\ 0 & 0 & 0 \\ -sC & 0 & sC \end{bmatrix}$$

$$Y_{gy} = \begin{bmatrix} 0 & g_1 & -g_1 \\ -g_1 & 0 & g_1 \\ g_1 & -g_1 & 0 \end{bmatrix}$$

$$\therefore Y = \begin{bmatrix} sC & g_1 & -sC-g_1 \\ -g_1 & 0 & g_1 \\ g_1-sC & -g_1 & sC \end{bmatrix}$$

putting, $v_3 = 0$

$$Y = \begin{bmatrix} sC & g_1 \\ -g_1 & 0 \end{bmatrix}$$

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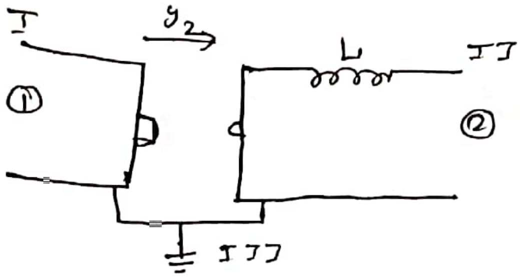


$$Z_L = \begin{bmatrix} 0 & 0 \\ 0 & sL \end{bmatrix}$$

$$Z_{gy} = \begin{bmatrix} 0 & -1/g_2 \\ \frac{1}{g_2} & 0 \end{bmatrix}$$

$$Z_{total} = \begin{bmatrix} 0 & -\frac{1}{g_2} \\ \frac{1}{g_2} & sL \end{bmatrix}$$

$$y = Z_{total}^{-1} = \left[\begin{array}{cc|cc} 1 & 0 & 0 & -\frac{1}{g_2} \\ 0 & 1 & \frac{1}{g_2} & sL \end{array}\right]$$

$$= \begin{bmatrix} g_2^2\, sL & g_2 \\ -g_2 & 0 \end{bmatrix}$$

(b) for, $y_1 = y_2$

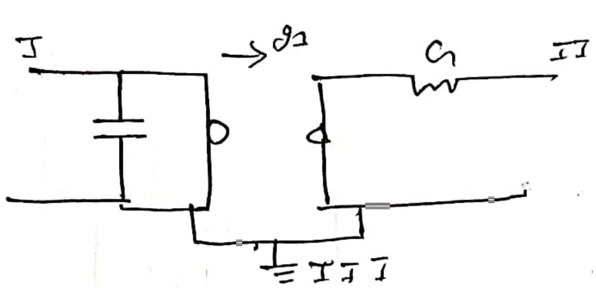
$$g_1 = g_2$$

and $g_2^2 sL = sC$

$$\Rightarrow L = C/g_2^2$$

$$\therefore L = \frac{C}{g_2^2} = \frac{C}{g_1^2}$$

(c).



$YV = I$

From (c),

$$\begin{bmatrix} sC & g_1 \\ -g_1 & 0 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

and; $i_2 = G V_2$

$\Rightarrow sC v_1 + g_1 v_2 = i_1$

and $-g_1 v_1 = i_2$

$\therefore v_2 = \dfrac{i_2}{G} = \dfrac{-g_1 v_1}{G}$

$\therefore sC v_1 - \dfrac{g_1^2}{G} v_1 = i_1$

$\Rightarrow v_1 \left(sC - \dfrac{g_1^2}{G} \right) = i_1$

$\therefore y_{in}(s) = \dfrac{GsC - g_1^2}{G}$

So, the zeros at g_1^2/GC

and poles at ∞.

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