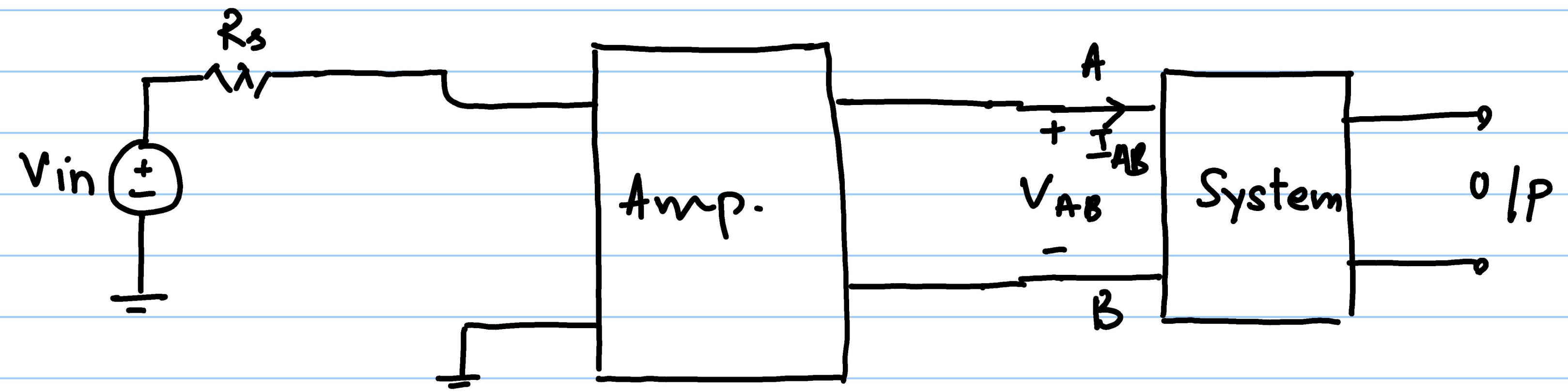
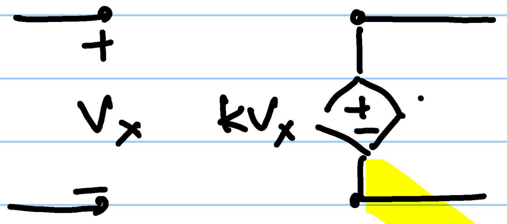
Lecture # 2

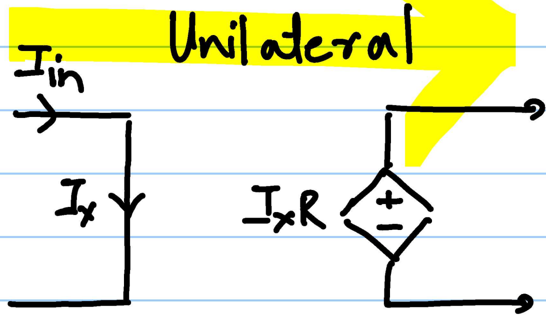
Note Title — 20-01-2022



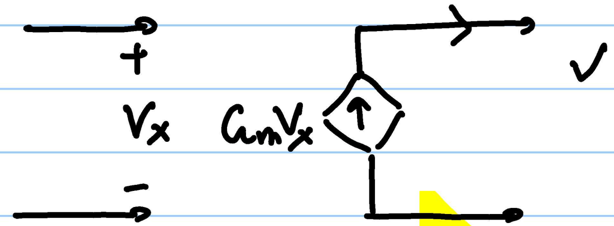
VCVS:



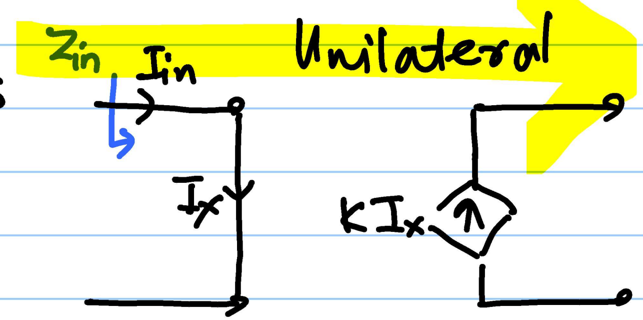
CCVS



VCCS:

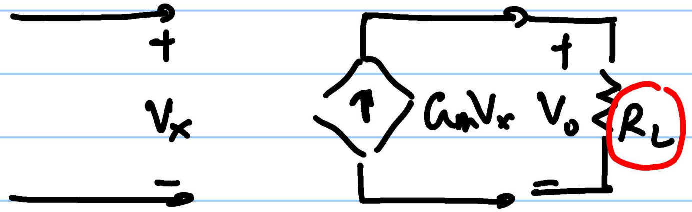


CCCS



$Z_{in} = 0$, $Z_o = \infty$

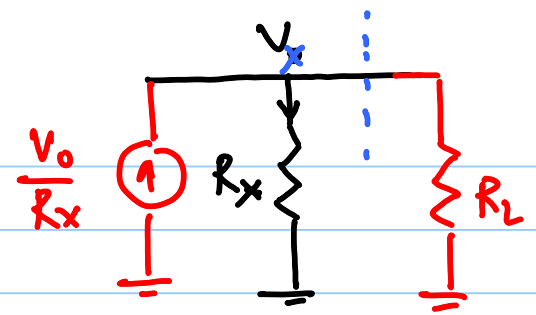
VCCS:



$$V_o = (G_m V_x)\, R_L = (G_m R_L)\, V_x$$

$$I_o = G_m V_x = \frac{V_x}{(1/G_m)} \doteq \frac{V_x}{R_x}$$

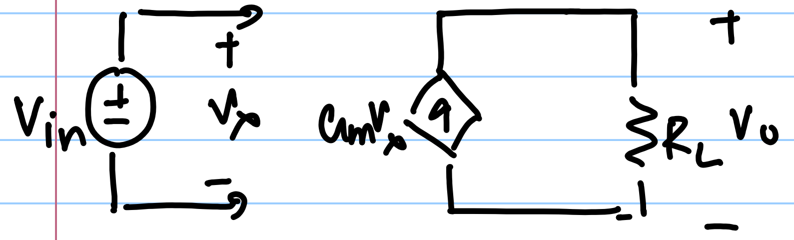
$V = f(I)$



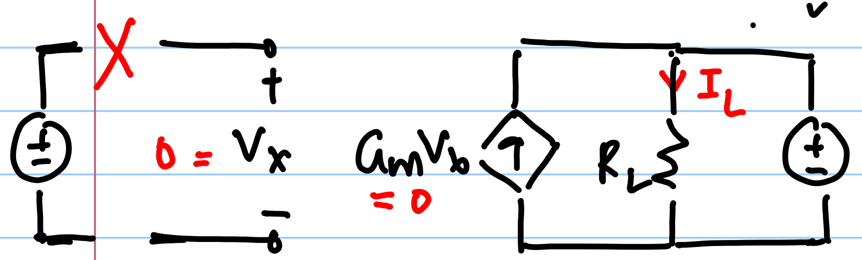
$I_x = \frac{V_o}{R_x}$

$V_x = \frac{V_o}{R_x} \times R_x = V_o$

$V_x = \frac{V_o}{R_x} (R_x \| R_L)$

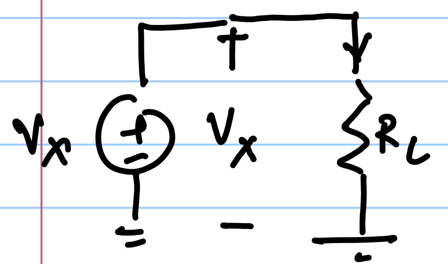


$V_o = (G_m V_{in}) R_L$

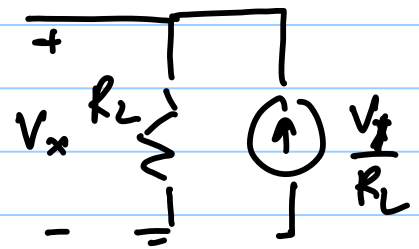


$V_o = (G_m V_1) R_L \longrightarrow V_x = V_1$

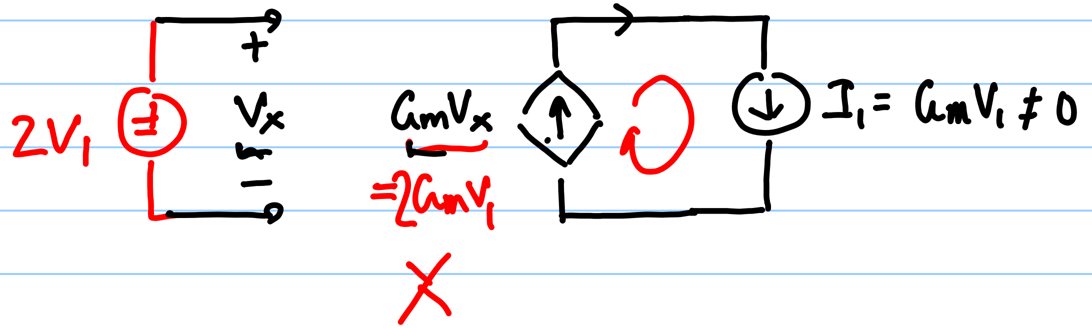
$I_L = \frac{(G_m V_1) R_L}{R_L} = G_m V_1$



$I_L = \frac{V_x}{R_L}$



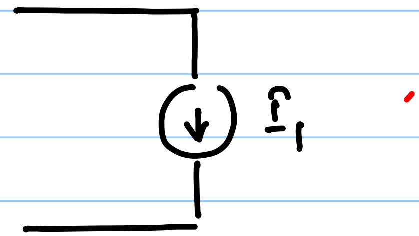
$V_x = V_1$



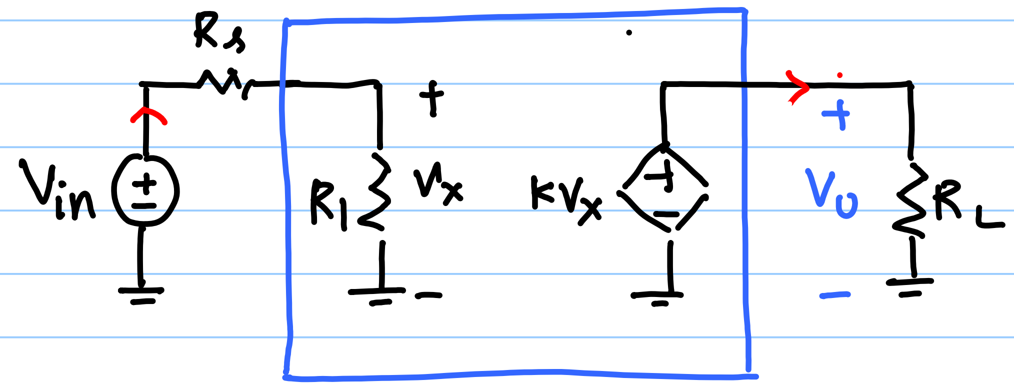
$G_m V_x = I_1 = G_m V_1$ — (1)

$V_x = V_1$

$V_x = 0$ — (2)



VCVS



$$V_x = \frac{R_1}{R_1 + R_s} V_{in}$$

$$V_o = \frac{K R_1}{R_1 + R_s} V_{in}$$

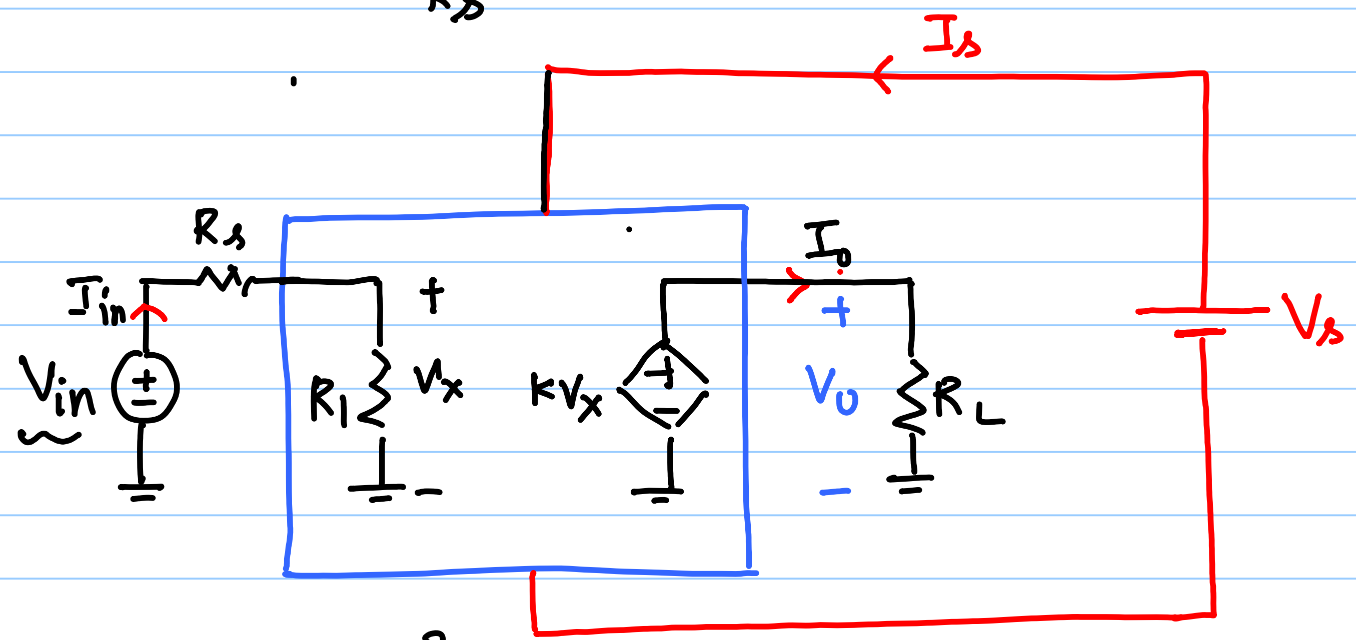
$$P_{in} = \frac{V_{in}^2}{R_s + R_1}, \quad P_o = K^2 \frac{R_1^2}{(R_1 + R_s)^2} V_{in}^2 \times \frac{1}{R_L}$$

$$\frac{P_o}{P_{in}} = \frac{K^2 R_1^2 / R_L (R_1 + R_s)^2}{1 / (R_s + R_1)} = \frac{K^2 R_1^2}{R_L (R_1 + R_s)}$$

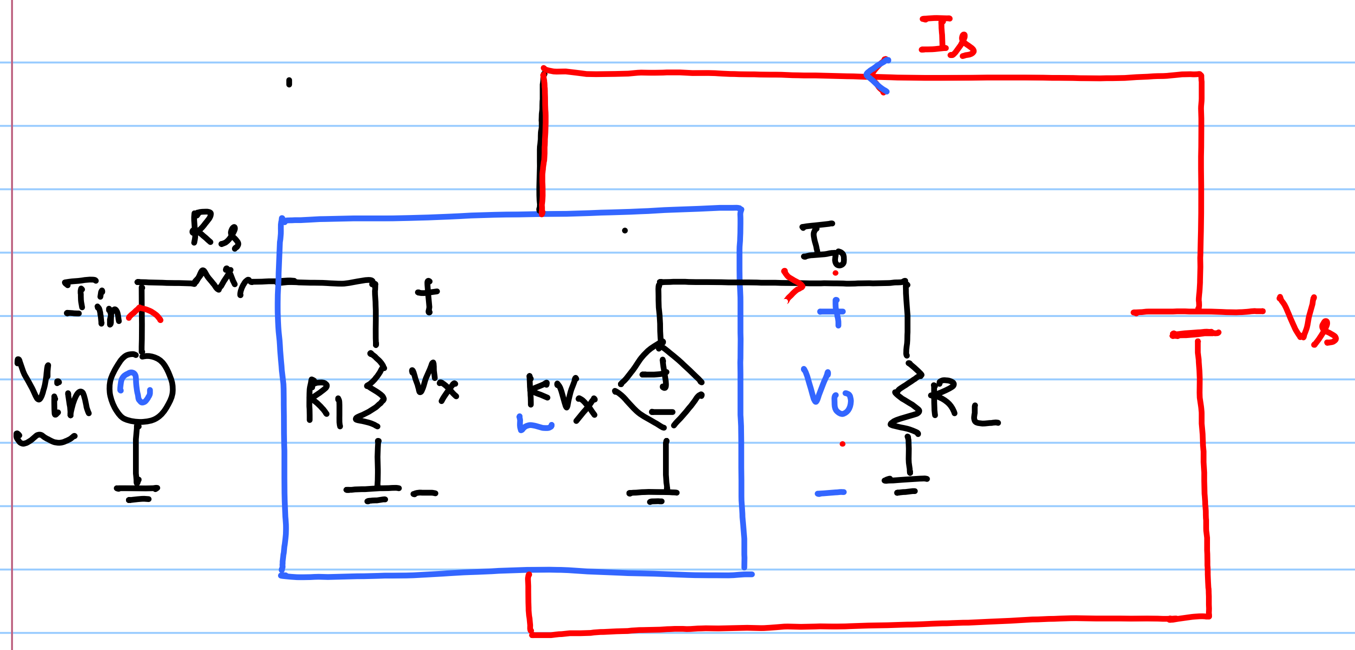
$$\frac{P_o}{P_{in}} = K^2 \frac{R_1^2}{R_L(R_1+R_s)}$$

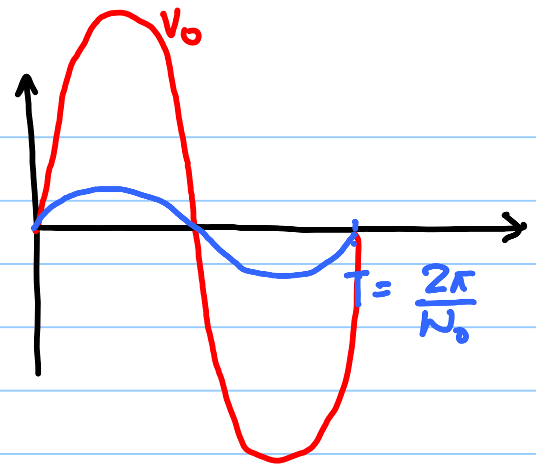
when $R_1 \to \infty$, $P_{in} = 0$, $P_o = \frac{K^2 V_{in}^2}{R_L}$ #1

$R_1 \to 0$, $P_{in} = \frac{V_{in}^2}{R_s}$, $P_o = 0$ #2



- $V_{in} I_{in} + V_s I_s = I_o^2 R_L$
- $V_{in} I_{in} < I_o^2 R_L$





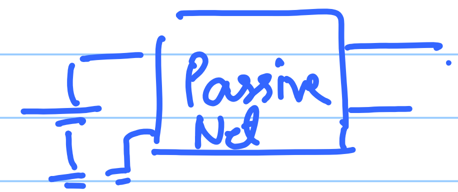
- Power drawn from i/p supply at ω_o
- Power supplied to the load R_L at ω_o

$V_{in} = A\sin(\omega_o t)$

$$V_o = \frac{R_1}{R_1+R_s} \cdot K \cdot A\sin(\omega_o t)$$

$$P_{in} = \frac{A^2}{2(R_1+R_s)}$$

$P_o =$



$V_o = f(V_{in}, V_s)$