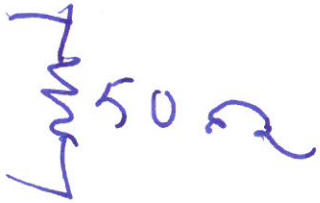
8 Sep 2016



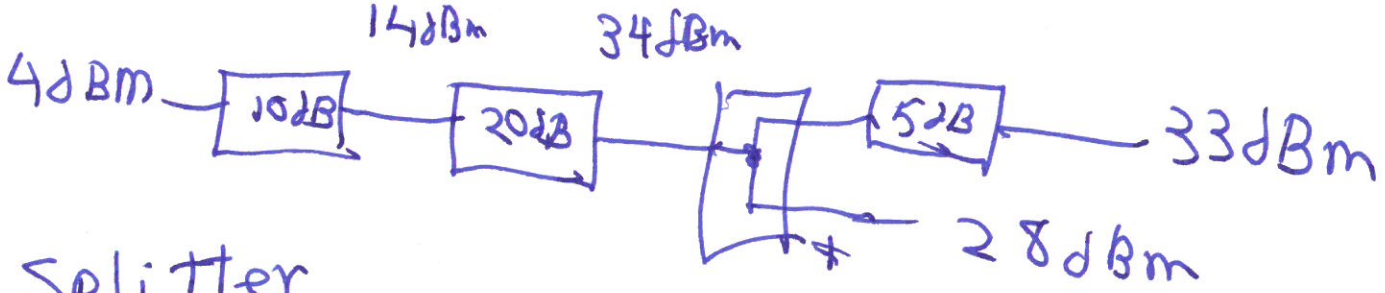
$$V_{rms} = \frac{V_{p-p}}{2\sqrt{2}}$$

$$dBm = 10\log_{10}\left[\frac{\left(\frac{1V}{2\sqrt{2}}\right)^2 / 50\Omega}{1mW}\right]$$

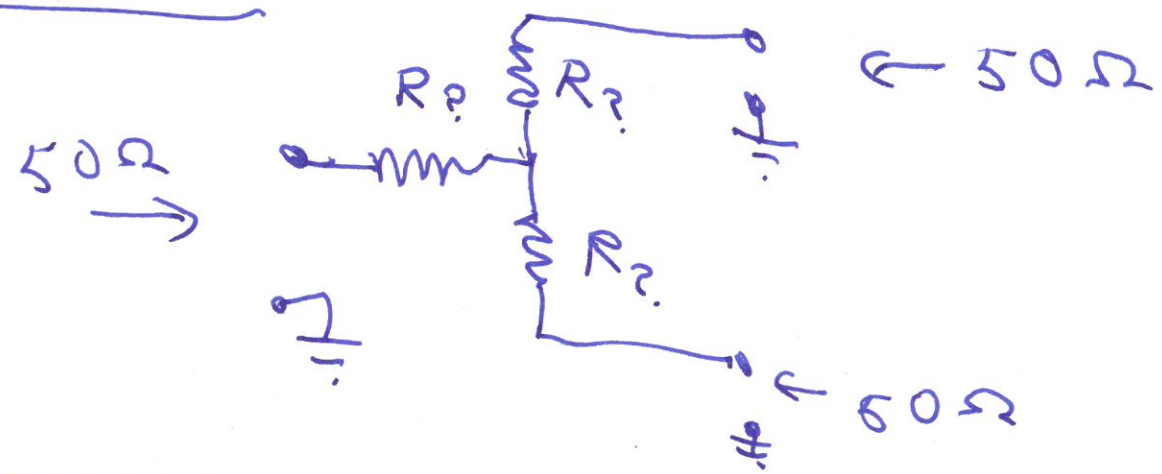
$$\approx 4dBm$$

Factor of 2 → 3dB

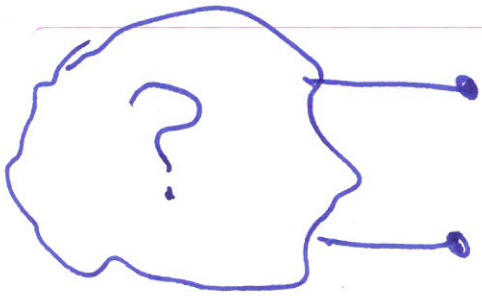
1V Rms → 13dBm

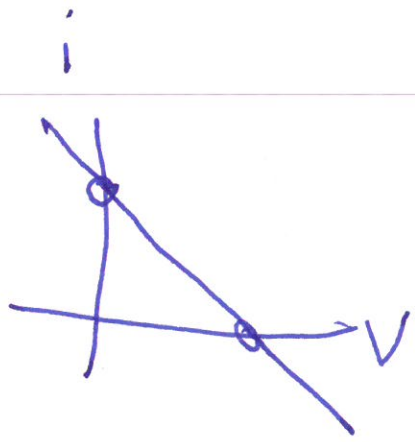


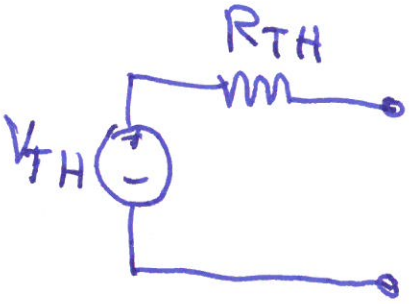
Splitter



Linear

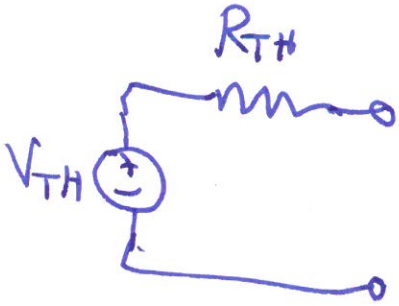


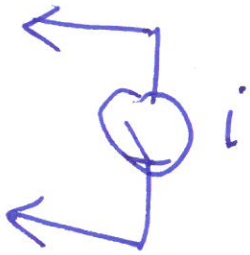




$R_L \rightarrow \infty$

$V_{OC} = V_{TH}$

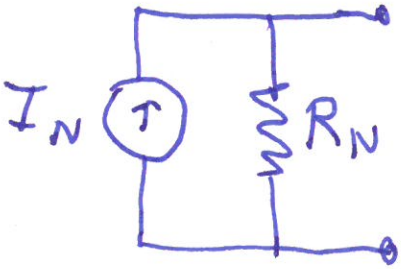




$R_L \rightarrow 0$

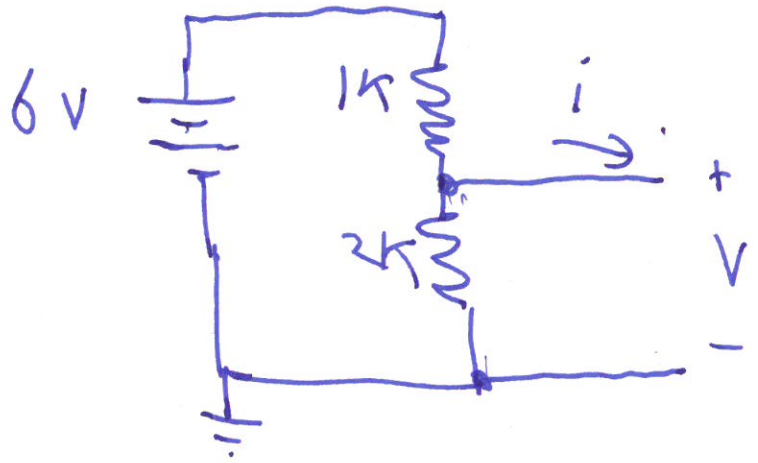
$I_{SC} = V_{TH} / R_{TH}$

$R_{TH} = V_{OC} / I_{SC}$



$I_N = I_{SC}$

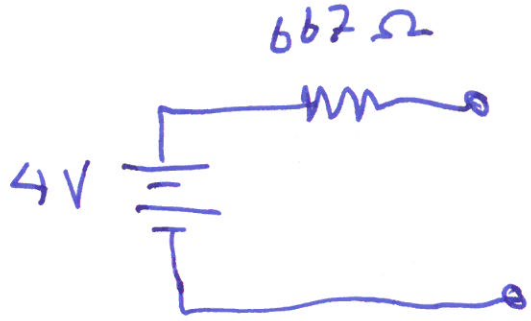
$R_N = V_{OC} / I_{SC} = R_{TH}$



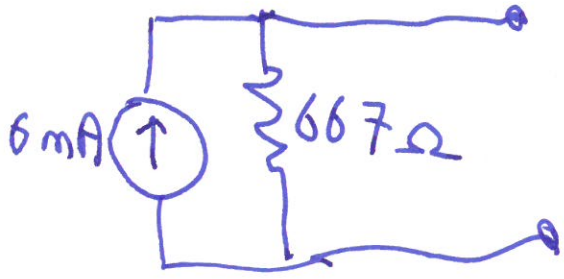
$$V_{OC} = 6V \frac{2k}{3k} = 4V$$

$$I_{SC} = \frac{6V}{1k} = 6mA$$

$$R_{TH} = R_N = \frac{4V}{6mA} = 667\Omega$$

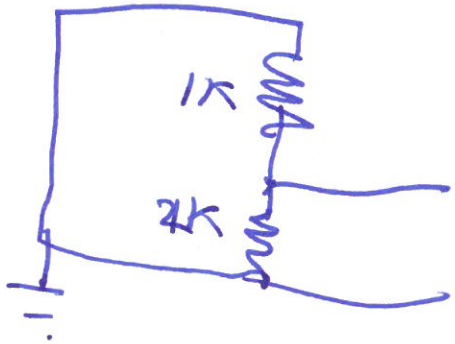


or



Alt. Calc of R_{TH}

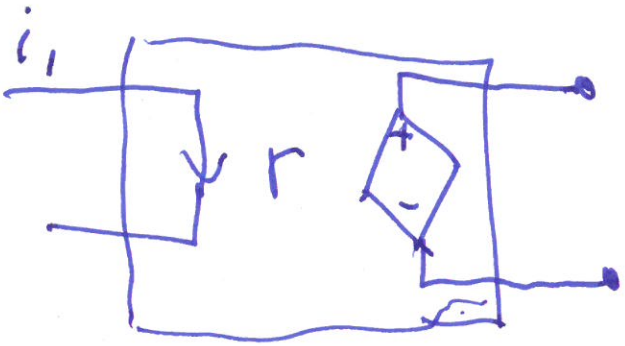
Suppress the source



$$R_{TH} = 1k \,||\, 2k$$
$$= 0.667k$$
$$= 667\Omega$$

Dependent Sources.

current controlled Voltage Source

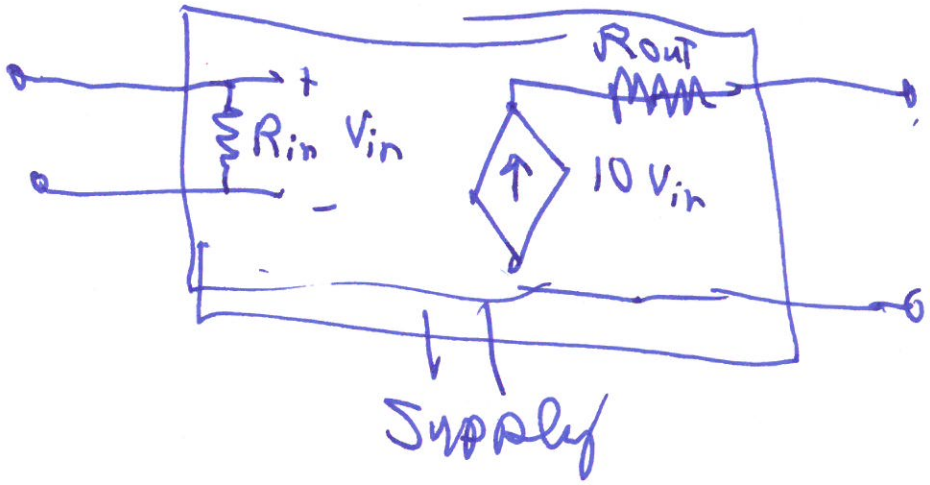


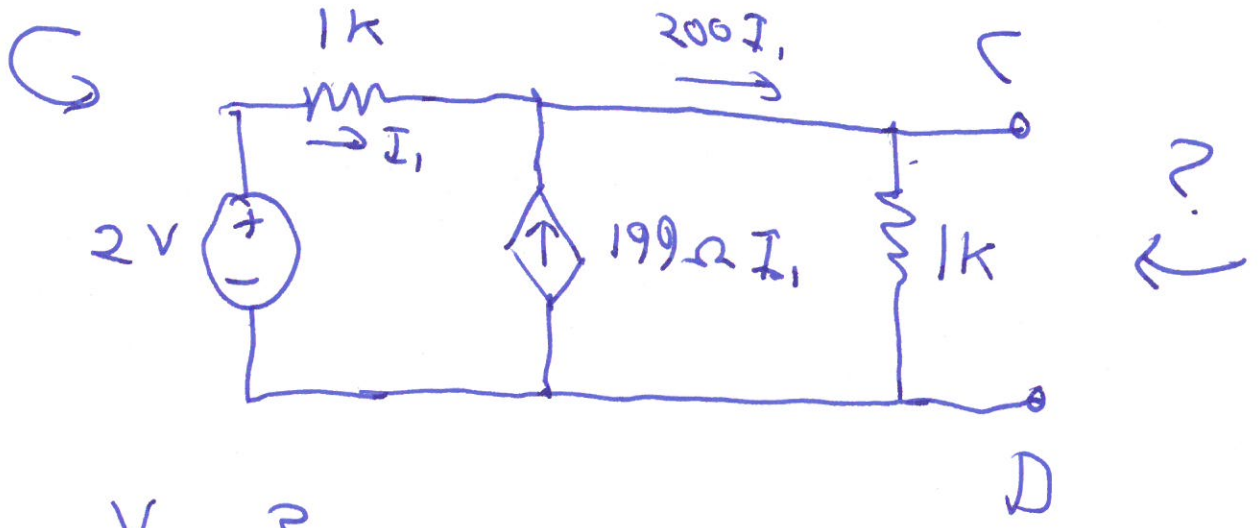
$V_2 = r\, i_1$

$i_1 \rightarrow i_2$ $\quad V_1 \rightarrow V_2$

$i_1 \rightarrow V_2$ $\quad V_1 \rightarrow i_2$

eg. voltage amplifier model





V_{OC} ?

KVL $\quad -2V + 1k\, I_1 + 200 I_1 \times 1k = 0$

$$I_1 = \frac{2V}{201k}$$

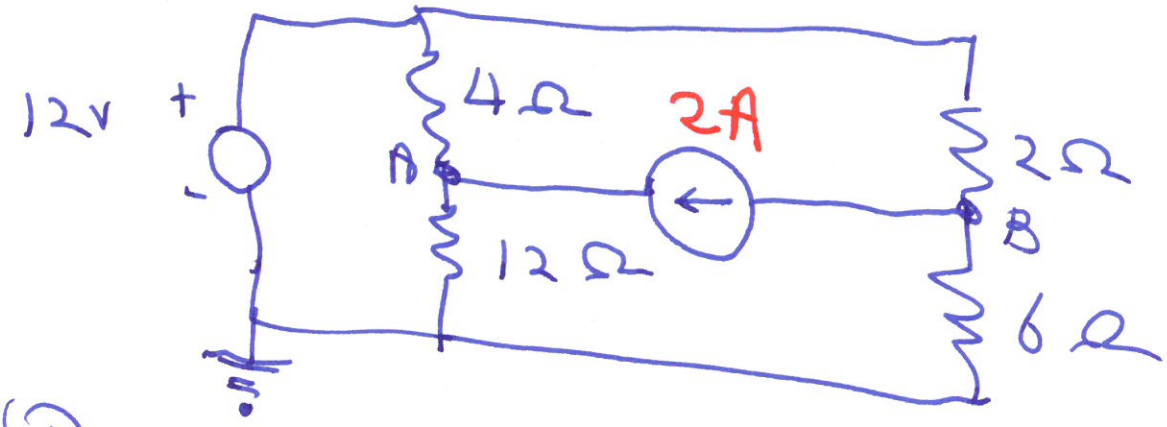
$$V_{CD} = V_{TH} = 200 \times 1k \times \frac{2V}{201k} = 1.99V$$

KCL $\quad I_{SC} = I_1 + 199 I_1 = 200 I_1$

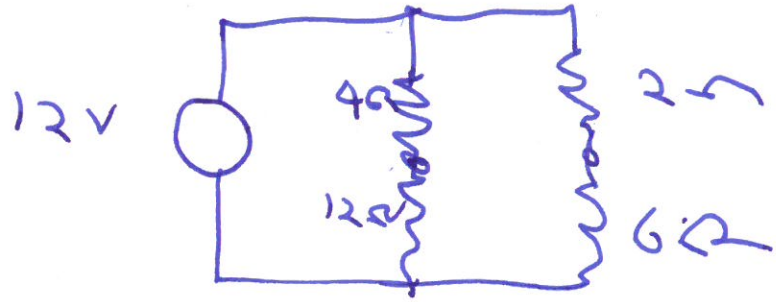
KVL $\quad -2V + I_1 \times 1k = 0 \qquad I_1 = \frac{2V}{1k}$

$$R_{TH} = \frac{V_{TH}}{i_{SC}} = 4.98\,\Omega$$

Superposition

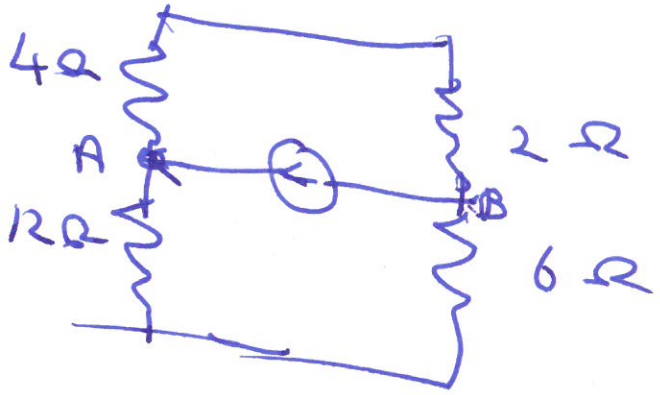


(1)



$V_{AB} = 0$

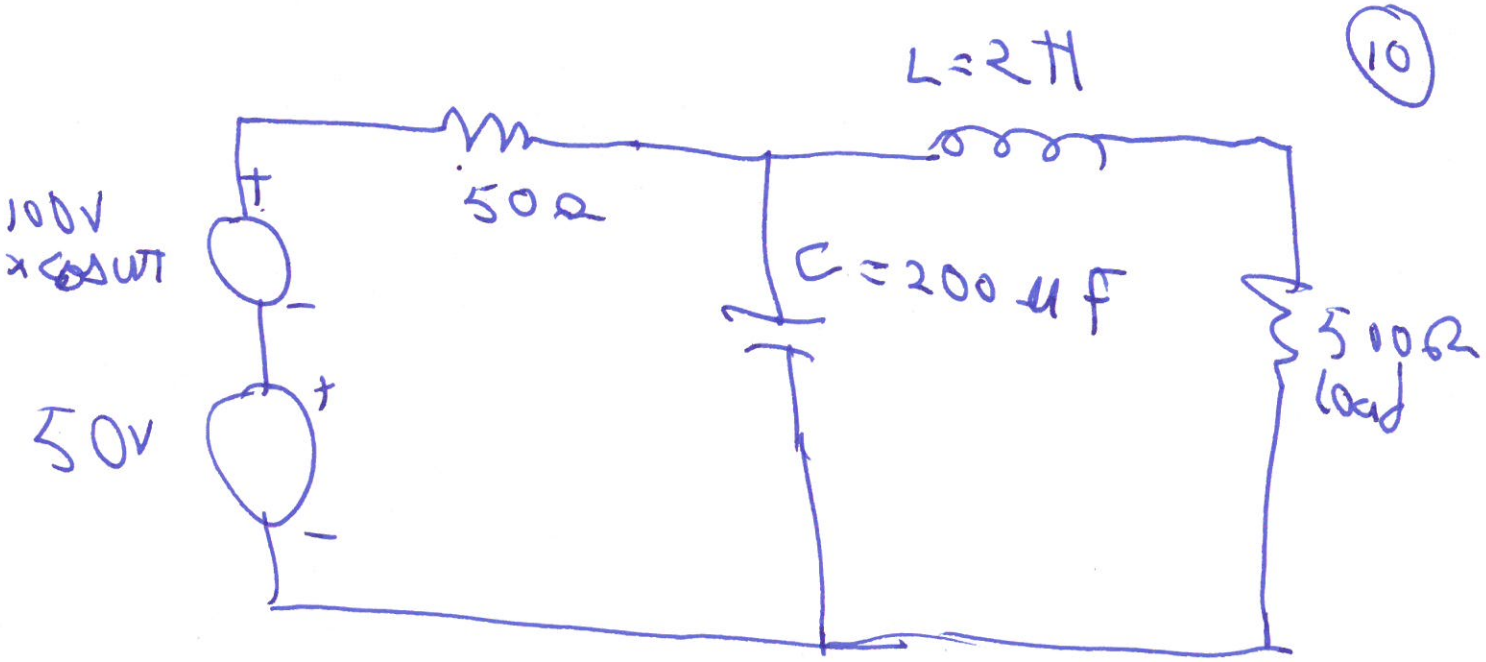
(2)



$= i\ 6\Omega \| 18\Omega$

$V_{AB} = 9\ V$

$V_{AB} = V_{AB①} + V_{AB②} = 0 + 9V = 9V$



400Hz $\quad\quad$ $w = 2\pi f$

$$Z_2 = (R_L + jwL) \,||\, \frac{1}{jwC}$$