Noise → random process

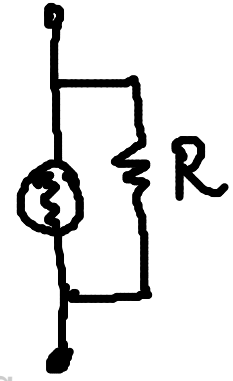
thermal → white, gaussian

uniform PSD → $df$ $4kTR\,df$




$\overline{v_n^2} = 4kTR\,df$

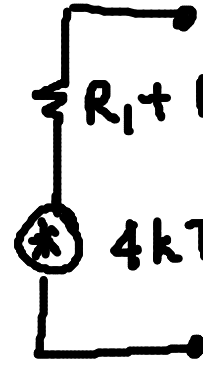
$\overline{i_n^2} = \dfrac{4kT\,df}{R}$



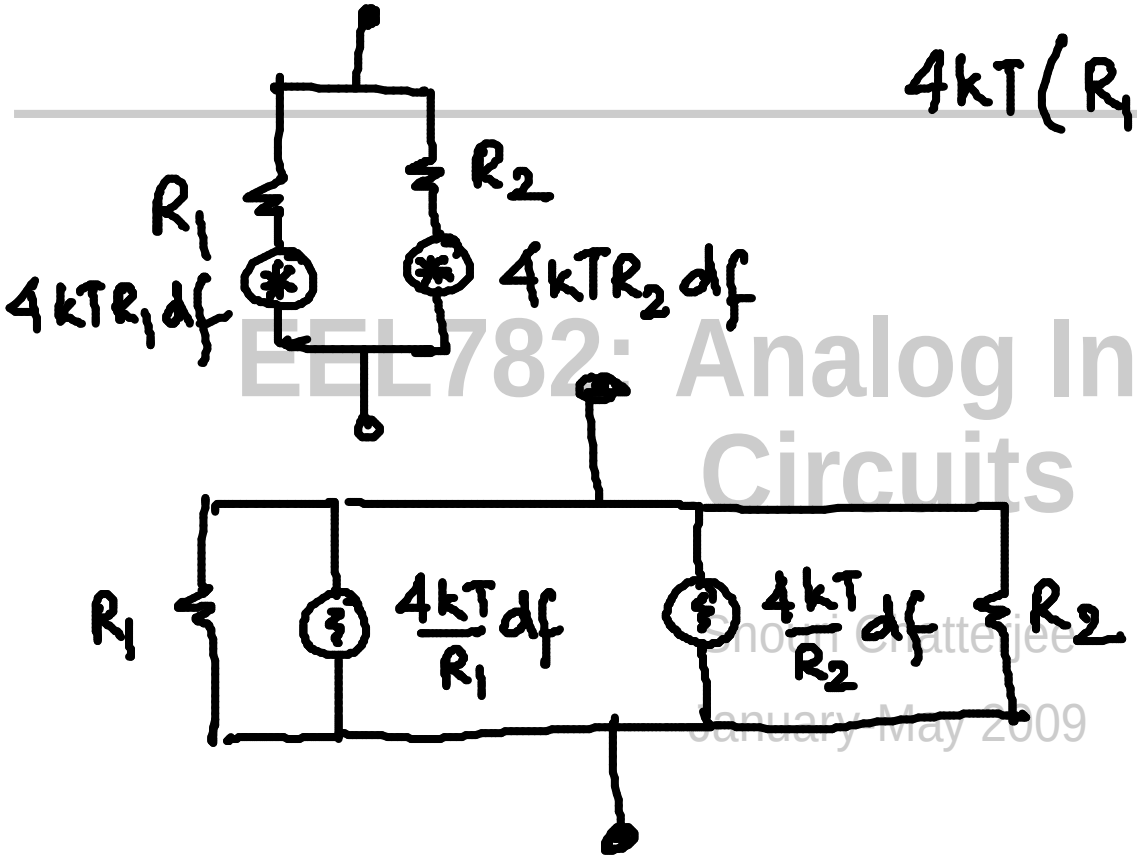



$\overline{v_{n_1}^2} = 4kTR_1\,df$

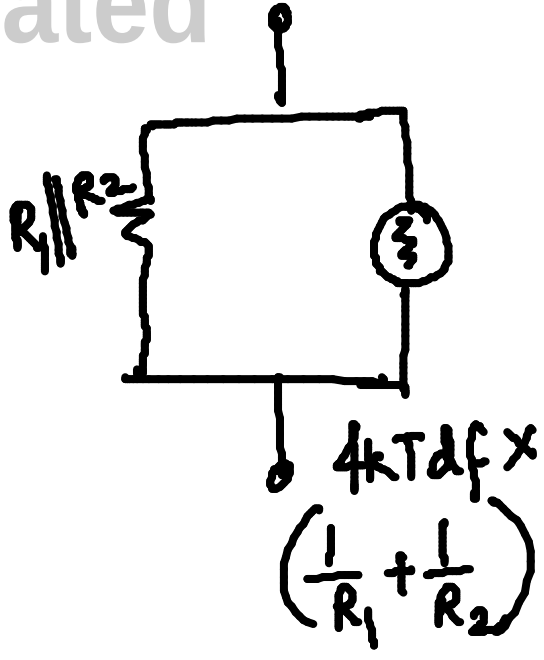
$\overline{v_{n_2}^2} = 4kTR_2\,df$



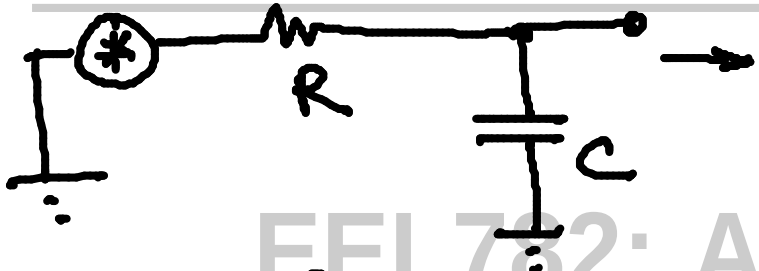

$(v_1+v_2)^2 = v_1^2 + v_2^2 + 2v_1v_2$




$4kT(R_1 \| R_2)\,df$

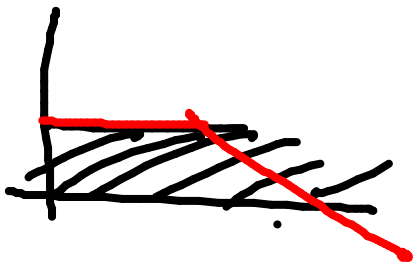


$$\overline{v_n^2} = 4kTR/2\pi \cdot d\omega$$






$$|V(\omega)|^2 \longrightarrow \left| \frac{V(\omega)}{1 + j\omega RC} \right|^2$$



$$\overline{v_{out}^2} = \int_0^\infty \frac{\frac{4kTR}{2\pi} d\omega}{1 + \omega^2 R^2 C^2}$$

$$= \frac{4kTR}{2\pi} \int_0^\infty \frac{d\omega}{1 + \omega^2 R^2 C^2}$$

$$= \frac{4kTR}{2\pi} \cdot \frac{1}{RC} \cdot \frac{\pi}{2}$$

$$= \frac{4kTR}{2\pi} \cdot \frac{1}{RC} \left[ \tan^{-1}(\omega RC) \right]_0^\infty$$

$$= kT/C$$