

Noise \rightarrow random process

thermal \rightarrow white, gaussian

uniform PSD \rightarrow df $4kTRdf$

EEL782: Analog Integrated Circuits

Shouri Chatterjee
January-May 2000

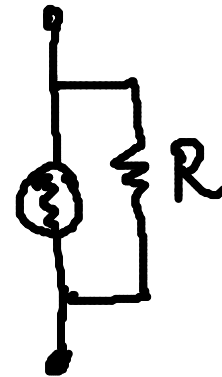
Department of Electrical Engineering,
Indian Institute of Technology, Delhi,
Hauz Khas, New Delhi 110016



$$\overline{v_n^2} = 4kTRdf$$

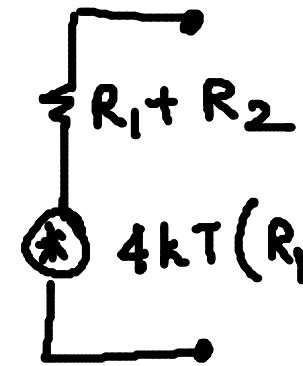
$$\overline{i_n^2} = \frac{4kTdf}{R}$$

$$\overline{v_n^2} = 4kTRdf$$



$$\overline{v_{n1}^2} = 4kTR_1df$$

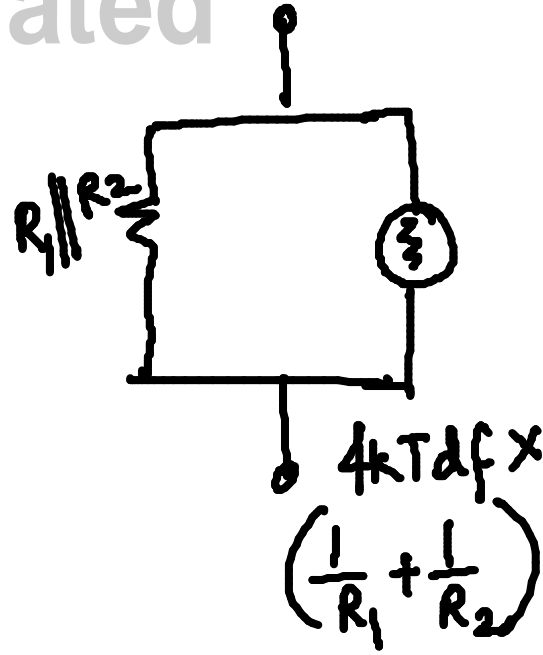
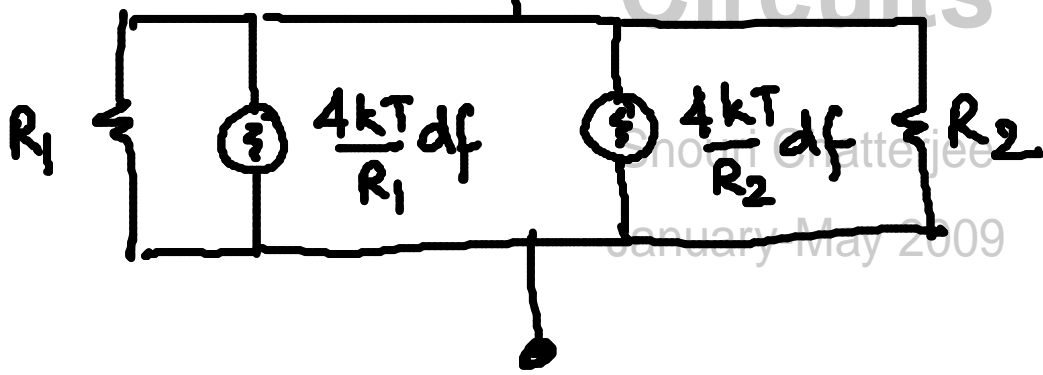
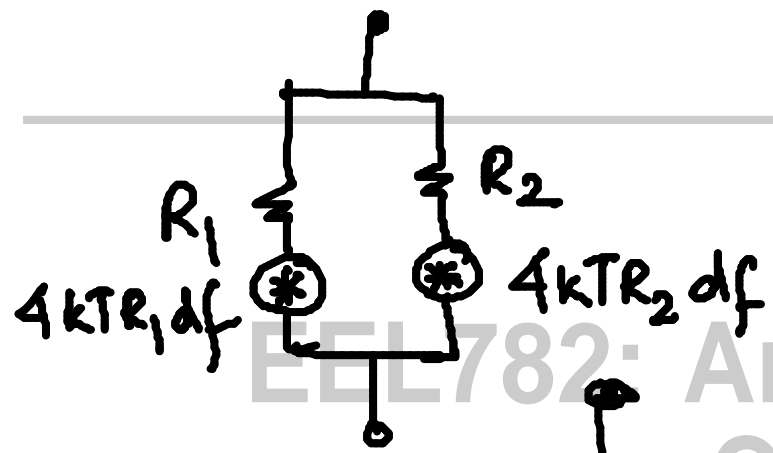
$$\overline{v_{n2}^2} = 4kTR_2df$$



$$4kT(R_1 + R_2)df$$

$$(\overline{v_1 + v_2})^2 = \overline{v_1^2} + \overline{v_2^2} + 2\overline{v_1 v_2}$$

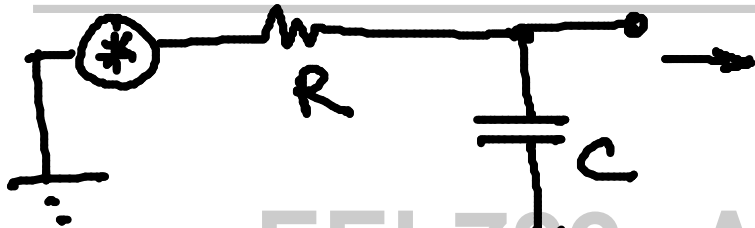
$$4kT(R_1 \parallel R_2)df$$



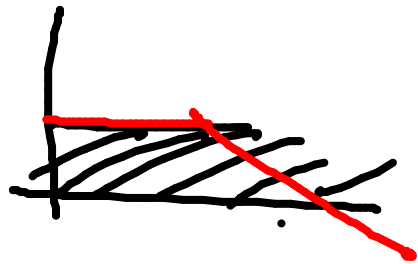
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$$\overline{v_n^2} = 4kTR/2\pi \cdot d\omega$$



$$|V(\omega)|^2$$



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

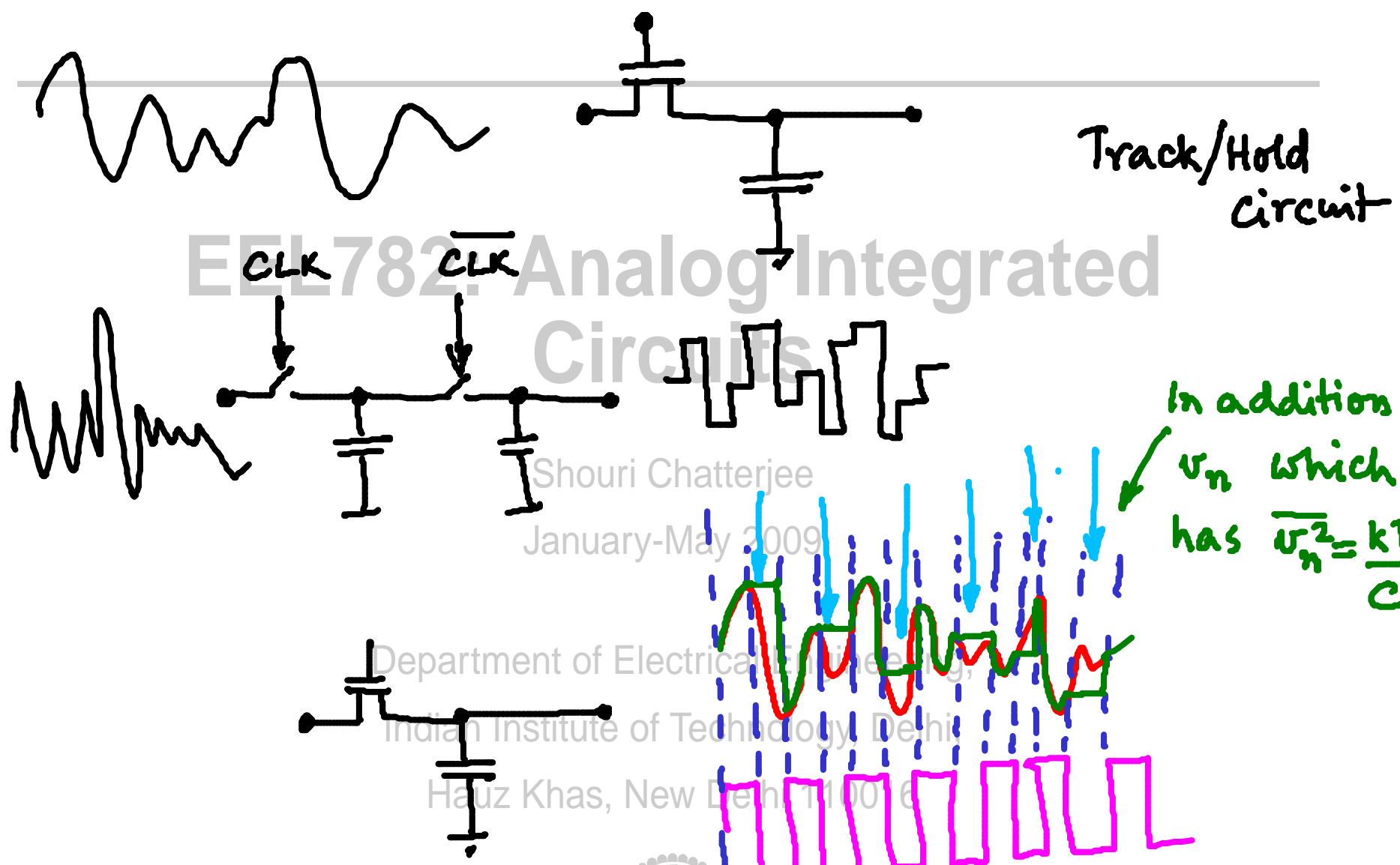
$$= \frac{4kTR}{2\pi} \cdot \frac{1}{RC} \cdot \frac{\pi}{2}$$

$$= kT/C$$



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

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



Track/Hold
Circuit

In addition
 v_n which
has $\overline{v_n^2} = \frac{kT}{C}$

$$\overline{v_n^2(nT)} = \frac{kT}{C}$$

$$\overline{v_n^2} = \frac{kT}{C}$$

What is the statistics
of the picks?

