

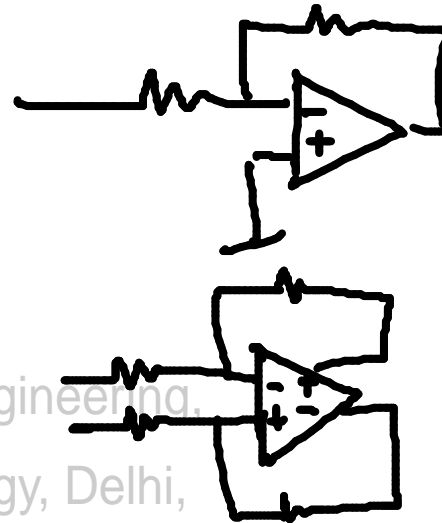
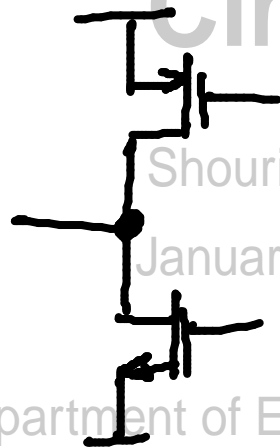
OTA transconductance

VCCS large R_o

Opamp

VCVS small R_o

output node has high imp \rightarrow floating



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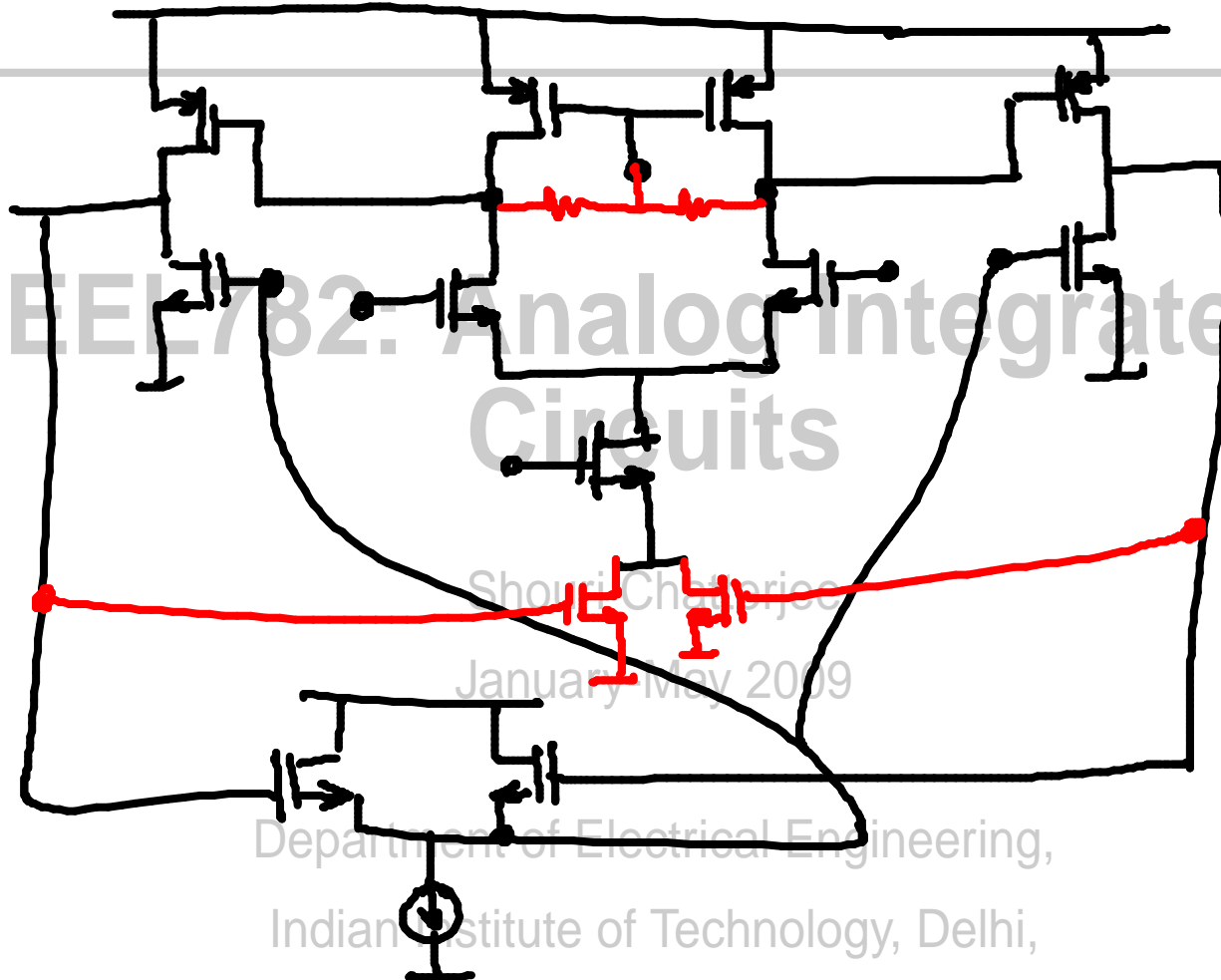
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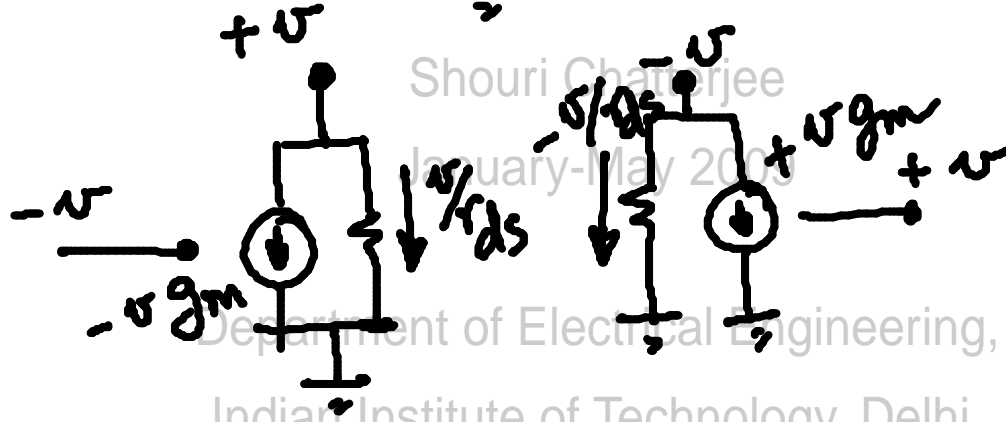
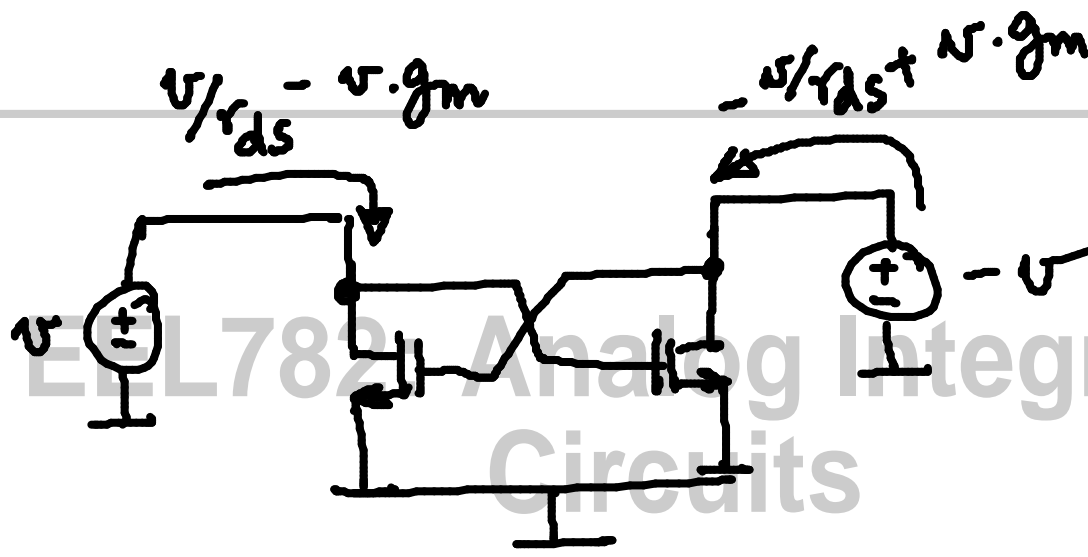


EEL782: Analog Integrated Circuits

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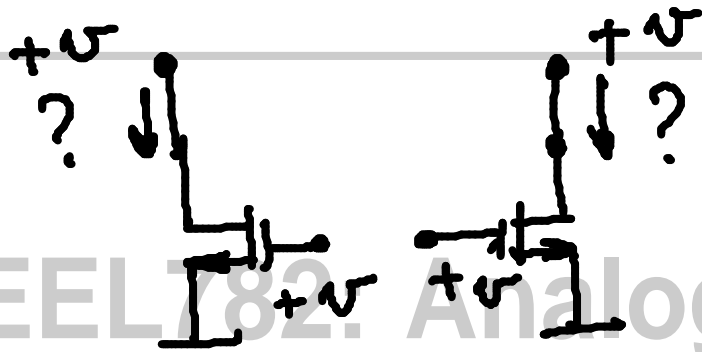


$$\frac{1}{\frac{1}{r_{ds}} - g_m}$$

$$R = -\frac{1}{g_m} \parallel r_{ds}$$

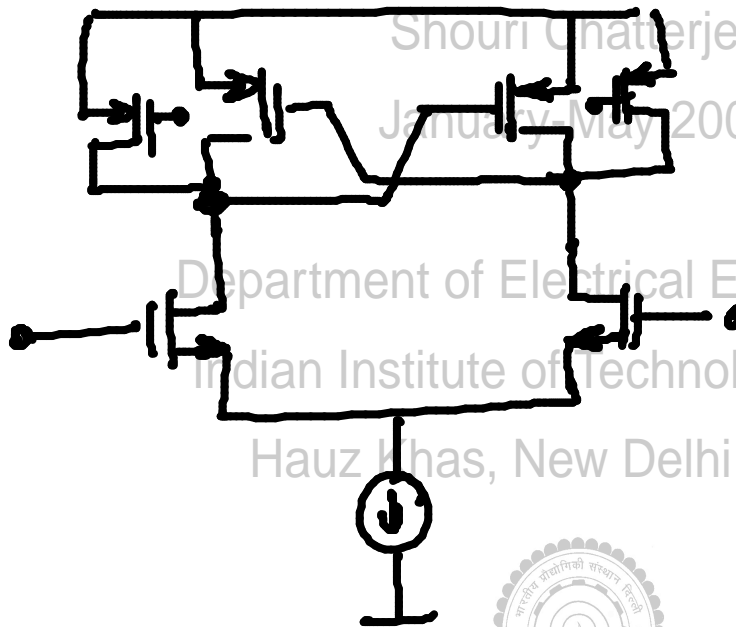
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$$R = \frac{1}{g_m} \parallel r_{ds}$$

EEL782: Analog Integrated Circuits



$$-g_m \cdot \left(r_{dsN} \parallel -\frac{1}{g_{mp}} \right) \parallel r_{dsp}$$

$$= -g_m \cdot \left(\frac{1}{\frac{1}{r_{dsN}} + \frac{1}{r_{dsp}} - g_{mp}} \right)$$



"Noise"

Bode

Any lossy component creates thermal noise

$\propto T$

$\propto R$

Circuits

noisy

R, MOS, BJT, diodes

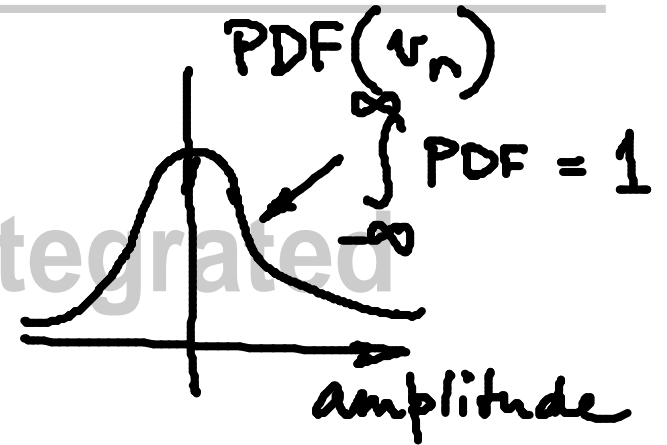
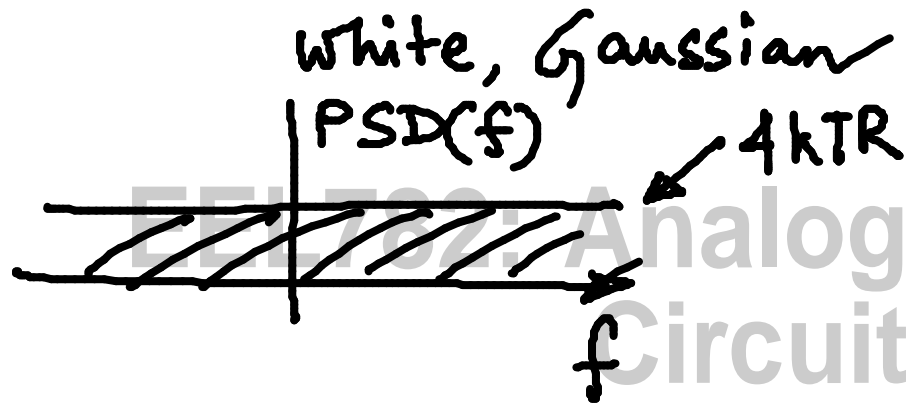
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thermal noise \rightarrow random process



Mean = 0

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$v_n^2 = 4kTR \Delta f$

$kT \rightarrow Vq \frac{Vt}{q} \frac{1}{t}$

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