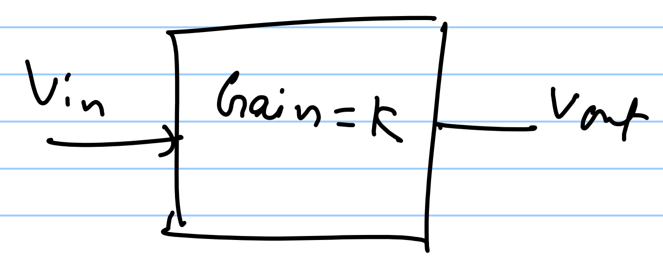
Note Title 2/7/2020

Signal Biasing

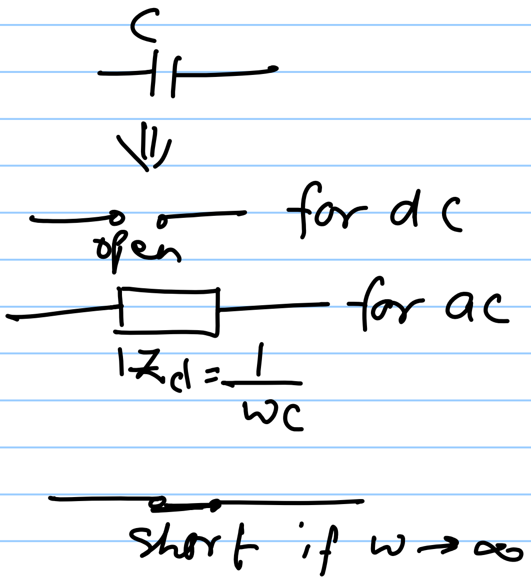
$$V_{in} = V_{in}(ac) + V_{in}(dc)$$

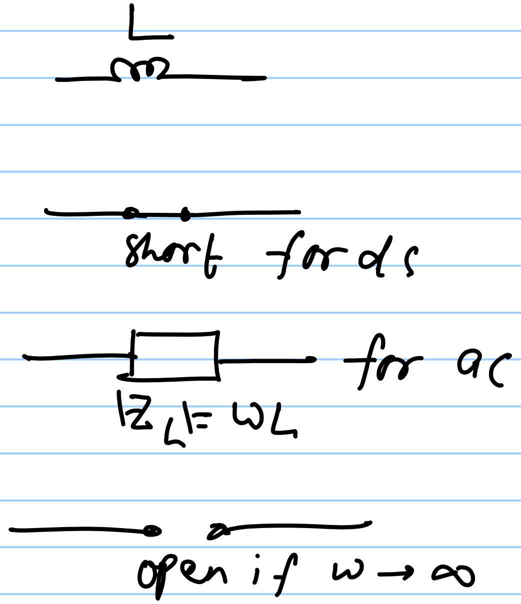
$$V_{out} = V_{out}(ac) + V_{out}(dc)$$



$$V_{out}(ac) = K\,V_{in}(ac)$$

$$V_{out}(dc) = V_{in}(dc)$$


C
open
for dc
for ac
$|Z_C| = \frac{1}{\omega C}$
short if $\omega \to \infty$

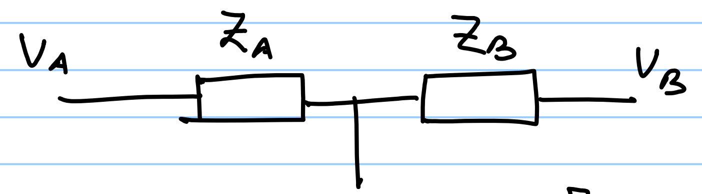

L
short for dc
for ac
$|Z_L| = \omega L$
open if $\omega \to \infty$

Shifting dc level

$$V_{in} = V_{in}(ac) + V_{dc1}$$

$\Downarrow$ shift

$$V_{in} = V_{in}(ac) + V_{dc2}$$



$$V_x = \frac{Z_A}{Z_A + Z_B} V_B + \frac{Z_B}{Z_A + Z_B} V_A$$

$$= \alpha V_B + \beta V_A$$

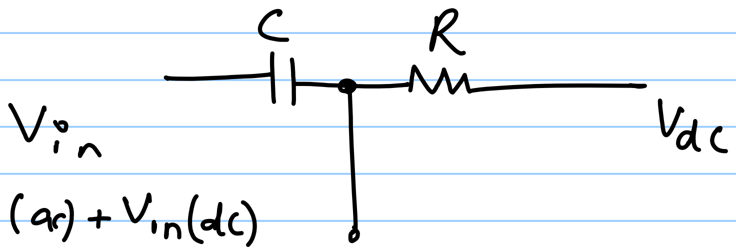
dc

$= 0$ for dc

$= \beta V_A$ for ac

$Z_A \rightarrow$ Cap

$Z_B \rightarrow$ Resistor



$= V_{in}(ac) + V_{in}(dc)$

↓

0 after capacitor.

$V_x = V_{in}(ac) + V_{dc}$

$Z_A = \frac{1}{sC}$ & $Z_B = R$

$$= \frac{Z_A}{Z_A + Z_B} V_B + \frac{Z_B}{Z_A + Z_B} V_A$$

$$V_x = \frac{\frac{1}{sC}}{\frac{1}{sC} + R} V_{dc} + \frac{R}{\frac{1}{sC} + R} V_{in}$$

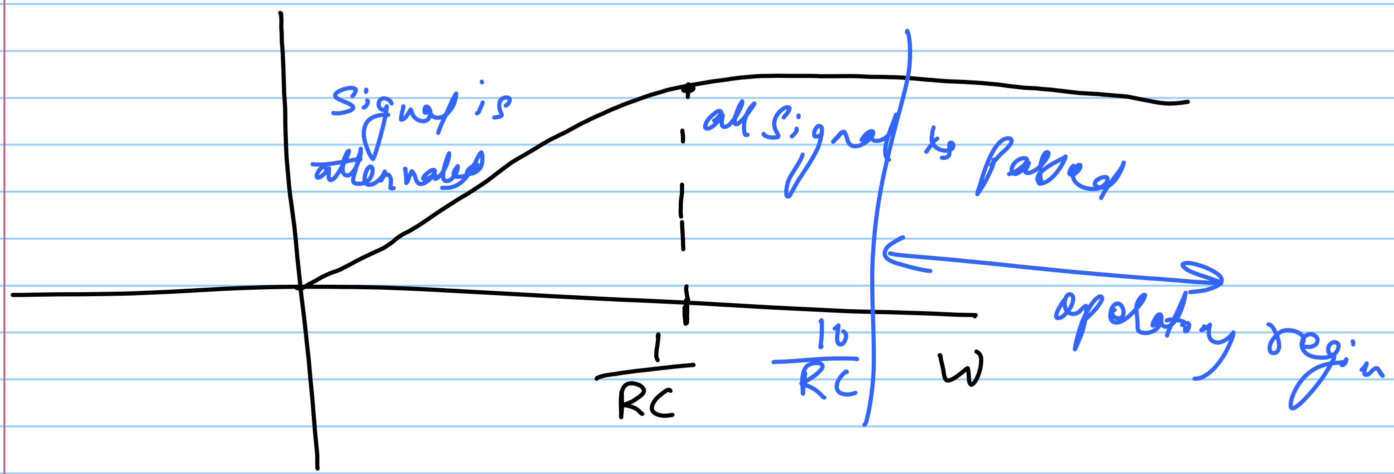
$$= \frac{1}{1 + RCs} V_{dc} + \frac{RCs}{1 + RCs} V_{in}$$

$\frac{RCs}{1+RCs} \sim 1$ for ac

for dc, $s = 0$

$RCs \gg 1$ or $R \gg \frac{1}{sC}$

$R \gg \frac{1}{\omega C} \approx 10\times$



$$w \gg \frac{1}{RC} \Rightarrow R \gg \frac{1}{wC}$$