[16th March '10]

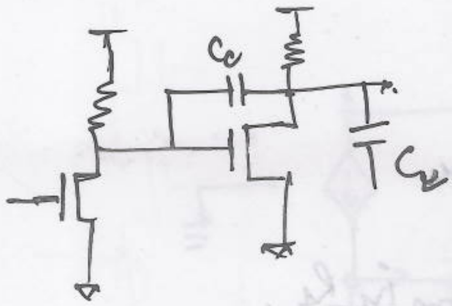


fig. 1

Understanding,

At low frequency you see two stages
& at high frequency one of the stage is shorted out.

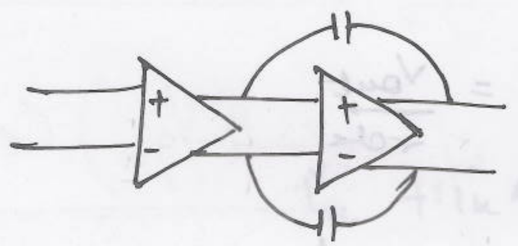


fig. 2

or provide alternate path.

for low frequency.

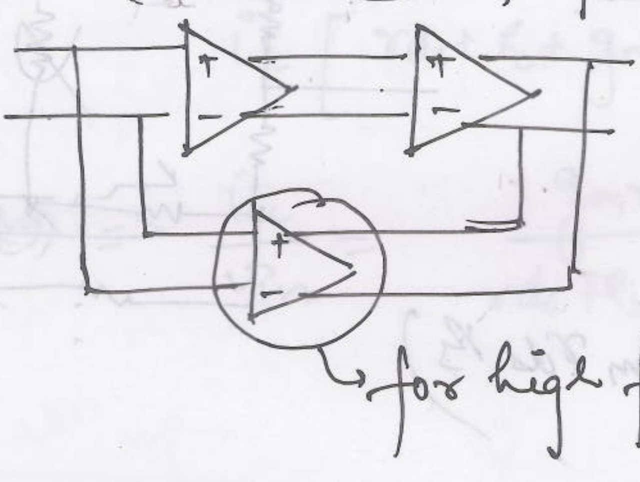


fig 3.

for high frequen

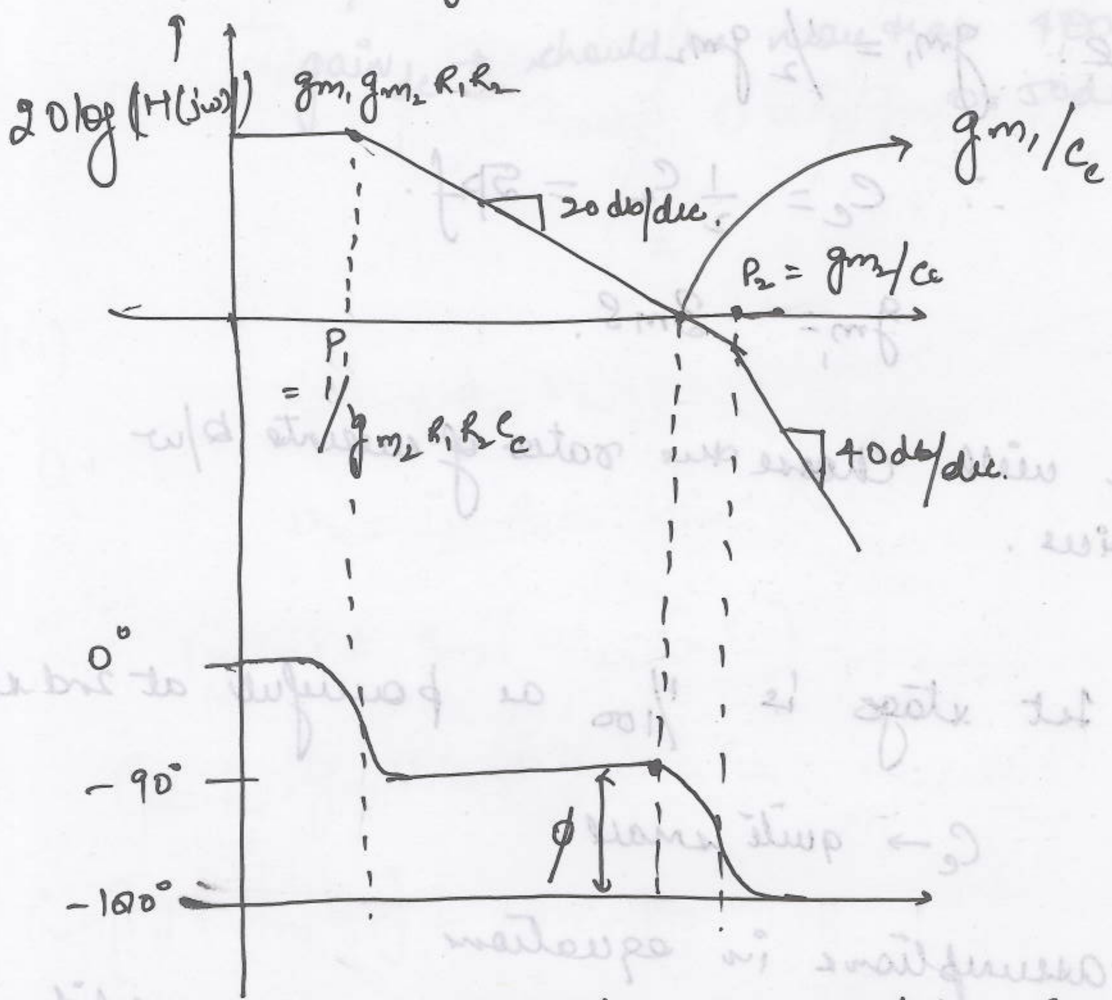
Analyzing figure I

$P_2 \rightarrow g_{m2}/C_L$

$P_1 \rightarrow \frac{1}{g_{m2} R_1 R_2 C_c}$

$$\frac{g_{m2}}{C_L} = \tan\phi . \frac{g_{m1} g_{m2} R_1 R_2}{g_{m2} R_1 R_2 C_c .}$$

$$C_c = C_L \frac{g_{m1}}{g_{m2}} \tan\phi .$$



* Design. 100 MHz unity gain amp. to drive $C_L = 10pf$.
$+ \phi = 45°$.

$\therefore C_c = 10pf$.

$\therefore 100MHz \times 2\pi \times C_c = g_{m1}$

$2 \times 3.143 \times 10^{-12} \times 10^{-8} = g_{m1}$

$\therefore g_m = 6.28mS$.

Suppose you are allowed to use 1mA current.

∴ differential two stages

each device is allowed for $\frac{1}{4}$ mA.

$$\therefore g_m = \sqrt{\mu C_{ox} \frac{W}{L} 2 I_D}$$

∴ if techno is known.

~~gm can~~ W/L is fixed.

* if two stages are not identical

i.e. $g_{m_1} = \frac{1}{2} g_{m_2}$

$$\therefore C_c = \frac{1}{2} C_L = 5pf.$$

$$g_{m_1} = 3mS.$$

at you will choose the ratio of currents b/w devices.

* if 1st stage is 1/100 as powerful at 2nd stage.

$C_c \rightarrow$ quite small.

assumptions in equations

C_c is large are no more valid.

Choice 65 nm ST techno / choose on your own.

a) → optimal in power consumption

or

b) optimal in Area.

or

c) optimal in power supply voltage.

unity gain bandwidth

Unity Band. = 200 MHz

$C_L = 10\,pf$

$\phi = 60^\circ$.

$gain_{dc}$ → should be more than 400 or 50dB.