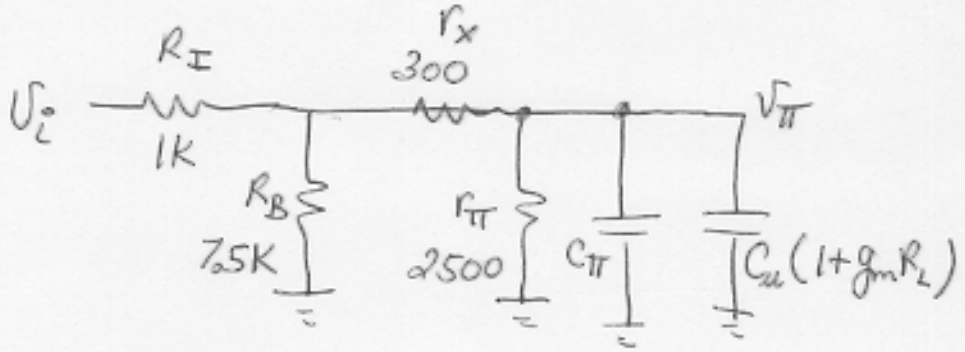
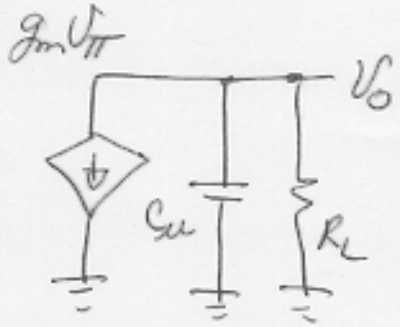
Jaeger 3rd ed

16.57

get numbers from prob 16.40

(also refer to prob 16.34)





$C_\mu = 0.75pF$

$f_T = 500\,MHz$

$I_C = 1mA$

$g_m = 40\,mS$

$\Rightarrow C_\pi = 12pF$

$\beta_o = 100$

$R_L \equiv R_3 \| R_C$; $R_3 = 100K$

but R_C = TBD

also $R_{eq} \equiv \left[(R_I \| R_B) + r_x\right] \| r_\pi = 803\,\Omega$

(a) f_H is essentially controlled by R_{eq}, C_μ and the g_mR_L product, so

$$5MHz = f_H \cong \frac{1}{2\pi} \frac{1}{R_{eq}\underbrace{\left[C_\pi + C_\mu(1+g_mR_L)\right]}_{C_T}}$$

$\Rightarrow C_T = 39.6pF$

$\Rightarrow (1+g_mR_L) = 36.9$

$\Rightarrow R_L = 896\,\Omega$ and $R_C = 904\,\Omega$

(b) $$A_m = \frac{R_B}{R_I+R_B} \frac{r_\pi}{(R_I \| R_B) + r_x + r_\pi} (-g_mR_L) = -21$$

$GBW = |A_m f_H| = 107\,MHz$ (quite similar to prob 16.40)