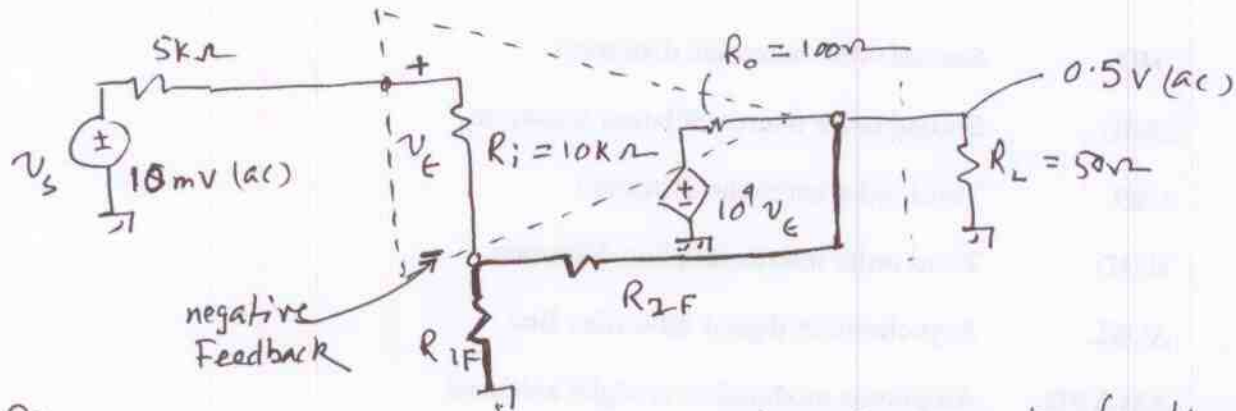
Design Case PE #2 chapter 4 (Section 4.5 in ELEC 312 lecture note)



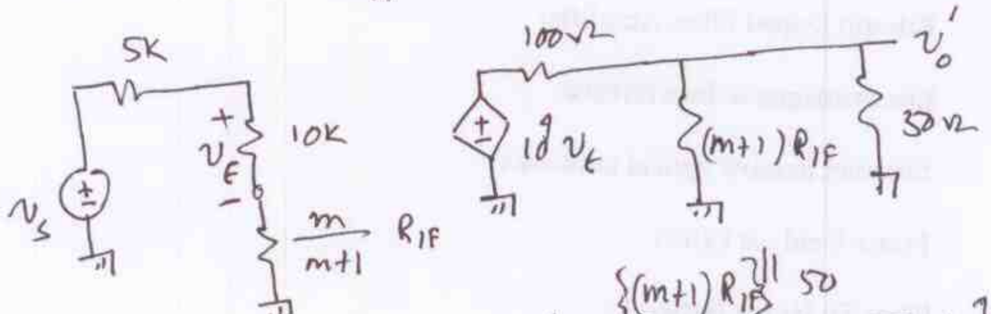
It is a series shunt feedback case. R_{1F}, R_{2F} are the feedback resistors.

$$h_{11} = R_{11} = R_{1F} \parallel R_{2F} \quad ; \quad \text{say } R_{2F} = m \cdot R_{1F}. \text{ Then}$$

$$h_{11} = R_{11} = \frac{m}{m+1} R_{1F}$$

$$h_{22} = \frac{1}{R_{1F}+R_{2F}} \rightarrow R_{22} = R_{1F} + R_{2F} = (m+1) R_{1F}$$

$$h_{12} = \beta = \frac{R_{1F}}{R_{1F}+R_{2F}} = \frac{1}{m+1}$$



Loaded amplifier

$$v_o' / v_s = ? \qquad v_o' = 10^4 \cdot \frac{\{(m+1)R_{1F}\} \parallel 50}{100 + \{(m+1)R_{1F}\} \parallel 50} \cdot v_s \cdot \frac{10K}{15K + \frac{m}{m+1} R_{1F}}$$

$$v_o'/v_s = 10^4 \times \frac{\{(m+1)\}R_{1F} \parallel 50}{100 + \{(m+1)R_{1F}\} \parallel 50} \cdot \frac{10{,}000}{15{,}000 + \frac{m}{m+1} R_{1F}}$$

$$= A_{\text{loaded}}$$

$$A_{\text{loaded}}\,\beta = 10^4 \times \frac{\{(m+1)R_{1F}\}\,\|\,50}{100+\{(m+1)R_{1F}\}\,\|\,50} \cdot \frac{10{,}000}{15{,}000+\frac{m}{m+1}R_{1F}} \cdot \frac{1}{m+1}$$

$$\frac{A_{\text{loaded}}}{1+A_{\text{loaded}}\,\beta} = \frac{F\cdot\frac{1}{m+1}}{1+\frac{F}{m+1}}$$

Where $F = 10^4 \times \dfrac{\{(m+1)R_{1F}\}\,\|\,50}{100+(m+1)R_{1F}\,\|\,50} \cdot \dfrac{10{,}000}{15{,}000+\frac{m}{m+1}\cdot R_{1F}}$

~~$R_{1F}\,\|\,50 = \dfrac{R_{1F}\times 50}{R_{1F}+50}$~~

$$(m+1)R_{1F}\,\|\,50 = \frac{(m+1)R_{1F}\times 50}{(m+1)R_{1F}+50}$$

Use Maple program:

Solve for $\dfrac{F}{1+F\beta} = \dfrac{F}{1+\frac{F}{m+1}}$

$= 10$ relating 'm' and R_{1F}

R_{1F}	m	$R_{2F} = mR_{1F}$
100	9.047	
~~500~~	~~9.047~~	
	9.047	
10	9.06	
1000	9.07	

$R_{2F} \approx 9\,R_{1F}$

& $R_{2F}+R_{1F} \simeq$ '10' units