

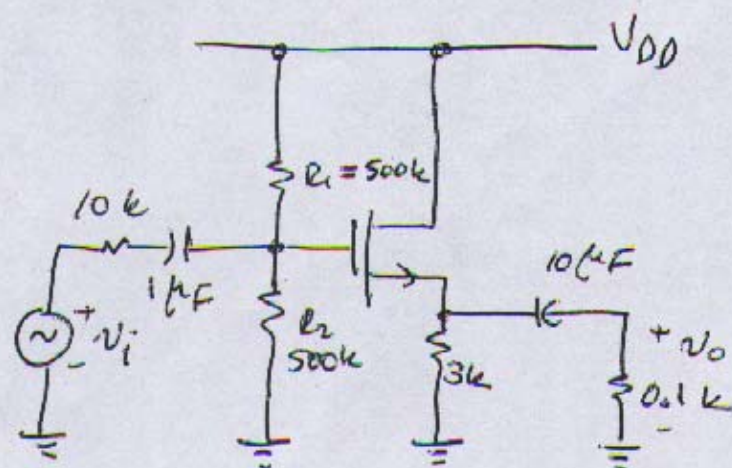
Name: ERKAYA Electronics I Quiz

Date: _____

ID number: SOLUTIONS

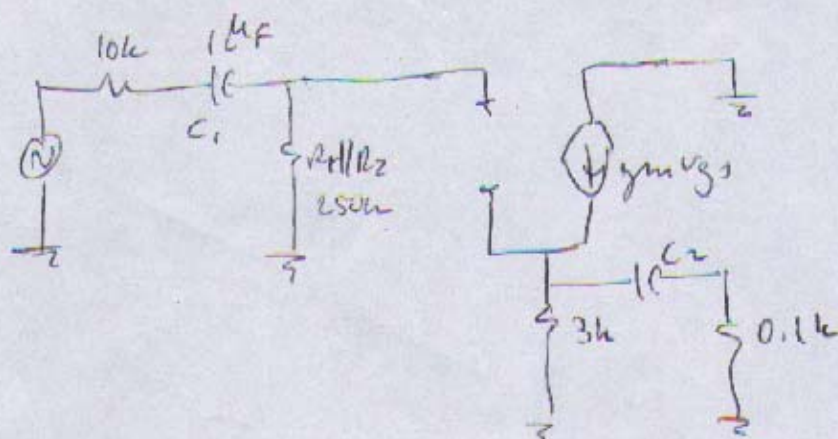
Signature: _____

For the amplifier circuit below, assume $g_m = 10 \text{ mA/V}$. Calculate the low 3-dB cut-off frequency.



$$f_c = \frac{81.42}{\text{Hz}}$$

small signal eq. ckt at low freq.



Two low freq. poles exist

$$\omega_1 = \frac{1}{C_1 R_{th1}}$$

$$R_{th1} = 10 + 250 = 260 \text{ k}\Omega$$

$$\omega_2 = \frac{1}{C_2 R_{th2}}$$

$$R_{th2} = \left(\frac{1}{g_m} \parallel 3\text{k} \right) + 0.1\text{k}$$

$$= (0.1 \parallel 3) + 0.1 \text{ k} = 0.197 \text{ k}$$

$$\omega_1 = \frac{1}{10^{-6} \times 260000} = 3.8 \text{ rad/s}$$

$$\omega_2 \approx \omega_1 + \omega_2 = 511.6 \text{ rad/s}$$

$$\omega_2 = \frac{1}{10^{-5} \times 197} = 507.6 \text{ rad/s}$$

$$\rightarrow 81.42 \text{ Hz}$$