**5.86** $R_{\text{in}}$ = depends on biasing

$$A_{vo} = -g_m(r_o \parallel R_D)$$

$$= -0.4\frac{\text{mA}}{v}(50 \text{ k}\Omega \parallel 6 \text{ k}\Omega)$$

$$= -2.14\text{V / V}$$

$$r_o = \frac{V_A}{I_D} = \frac{10v}{0.2 \text{ m}A} = 50 \text{ k}\Omega$$

$$g_m = \sqrt{2\mu_n C_{ox}\frac{W}{L}I_D} = 0.4 \text{ mA / V}$$

$$R_o = r_o||R_D = 50 \text{ k}\Omega||6 \text{ k}\Omega = 5.36 \text{ k}\Omega$$

WITH $R_L$=10 k$\Omega$ and assuming losses due to source impedance are negligible

$$G_v = A_v = -g_m(r_o\|R_D\|R_L)$$

$$= -0.4\frac{\text{mA}}{v}(5.36 \text{ k}\Omega||10 \text{ k}\Omega) = -1.40\text{V / V}$$

For a 0.2V peak output, the input must be

$$\frac{0.2\text{V}}{1.4} = 0.143\text{V} \text{ peak}$$

**5.92** $Rs = 1\ \text{k}\Omega$

$$\frac{-g_m R'_L}{1 + g_m R_s} = -15$$

$$-g_m R'_L = -30$$

$$\therefore\ g_m = \frac{1}{R_s} = 1\,\text{ms}$$

for $A_v = -10$, let $R_s = \dfrac{2}{g_m} = 2\ \text{k}\Omega$