

PROBLEM SET 7

SOLUTIONS

Ex: 5.6

From figure 5.4 in text, at an operating point defined by $V_{GSQ} = 2.5V$
 $\Delta V_{DSQ} = 6V$, we have

$$g_m = \frac{\Delta i_D}{\Delta V_{GS}}$$

$$= \frac{(4.4 - 1.1) \text{ mA}}{1V}$$

$$g_m = 3.3 \text{ mS}$$

$$1/r_d = \frac{\Delta i_D}{\Delta V_{DS}} \approx \frac{(2.9 - 2.3) \text{ mA}}{(14 - 2)V}$$

$$\approx 0.05 \times 10^{-3}$$

$$r_d = 20 \text{ k}\Omega$$

Ex: 5.7

$$g_m = \left. \frac{\partial i_D}{\partial V_{GS}} \right|_{Q \text{ point}}$$

$$= \left. \frac{\partial}{\partial V_{GS}} K (V_{GS} - V_{t0})^2 \right|_{Q \text{ point}}$$

$$g_m = 2K (V_{GSQ} - V_{t0})$$