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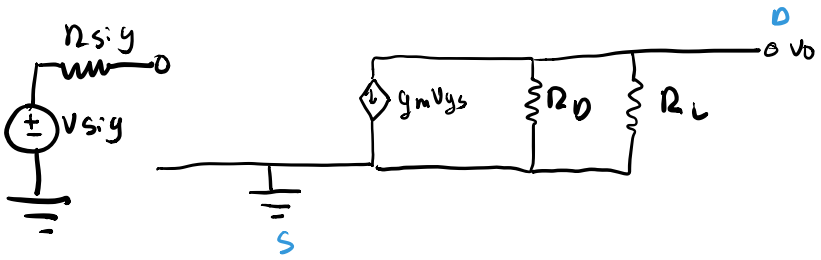
1.) Small signal model

$R_D = 6k\Omega$

$R_{sig} = 500\Omega$

$R_L = 10k\Omega$

$R_{in} = 625\Omega$



g_m

$R_{in} = \frac{1}{g_m} \Rightarrow 625 = \frac{1}{g_m}$ $\quad 625 g_m = 1$ $\quad g_m = .0016$

$g_m = 1.6\ mA/V$

G_v

$\frac{1}{6} + \frac{1}{10}$

$G_v = \frac{(R_D \| R_L)}{R_{sig} + 1/g_m} = G_v = \frac{3.75k\Omega}{500 + 1/1.6} = 7.49\ V/V$

2.) $k'_n = 300\ \mu A/V^2$

$V_t = 1.0\ V$

$\lambda = .045\ V^{-1}$

$\frac{W}{L} = 10$

$I_{DQ} = .2\ mA$

V_{DSQ}

$I_{DQ} = \frac{1}{2} k'_n \frac{W}{L} (V_{GSQ} - V_t)^2$

$.2\ mA = \frac{1}{2} (.3\ mA)(10)(V_{GSQ} - 1.0)^2$

$V_{GSQ} = \sqrt{.133} + 1$

$V_{GSQ} = 1.365 = 1.37$

$r_o = \frac{V_A}{I_{DQ}}$? not sure, out of time.

$g_m = k'_n \frac{W}{L} (V_{GSQ} - V_t)$

$g_m = (.3)(10)(1.37 - 1.0)$

$g_m = 1.1\ mA/V$