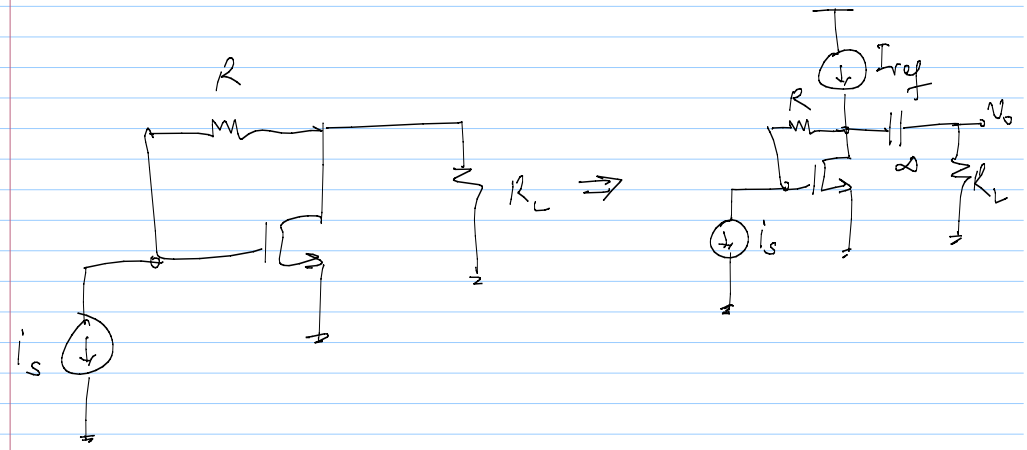
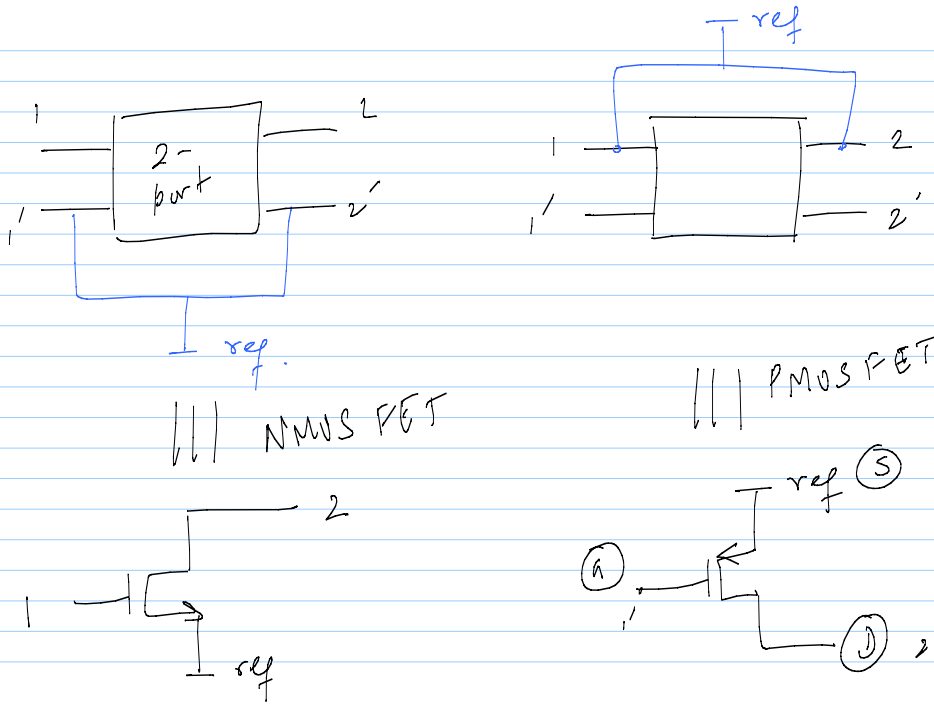
29/9/14

lec 28





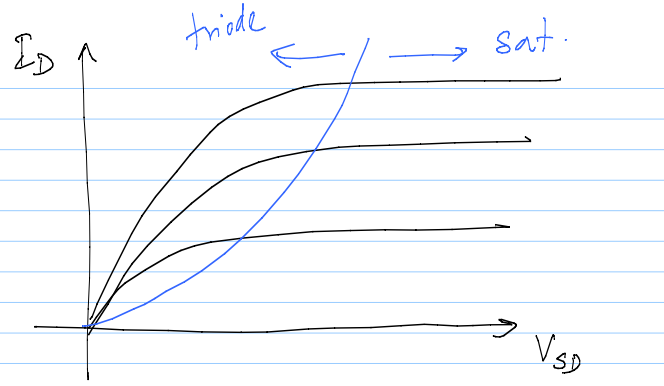
	I_D NMOS	PMOS I_D
*	I_D flows into (D)	I_D flows out of (D)
*	For sat., $V_D >> V_S$	For sat. : $V_D << V_S$
	$V_D \geq V_G - V_T$	$V_D \leq V_G + V_T$
*	$V_{GS} \geq V_{T_n}$ for $I_D > 0$	$V_{SG} \geq V_{T_p}$ for $I_D > 0$
*	$V_{T_n} > 0$ for enhancement device	$V_{T_p} > 0$ for an enh. device

Sat

$$I_D = \frac{1}{2} \mu_p C_{ox} \left(\frac{W}{L}\right) \left[V_{SG} - V_{T_p}\right]^2 \left[1 + \lambda_p V_{SD}\right]$$

non-sat. :

$$I_D = \mu_p C_{ox} \left(\frac{W}{L}\right) \left[(V_{SG} - V_{T_p}) V_{SD} - \frac{V_{SD}^2}{2}\right]$$



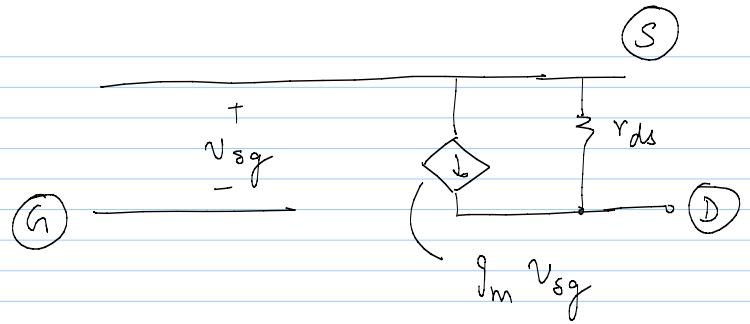
PMOS output char.

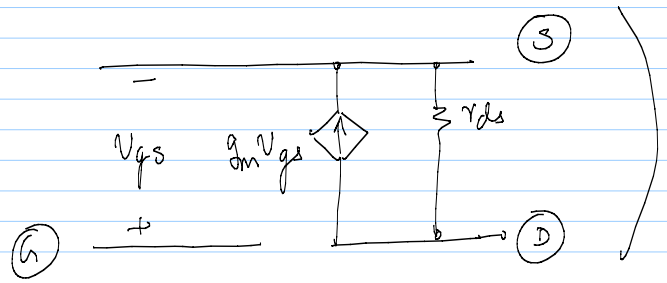
Small-Signal

$$y_{11} = 0, \quad y_{12} = 0$$

$$y_{21} = g_m = \mu_p C_{ox} \left(\frac{W}{L}\right) \left[V_{SG} - V_{T_p}\right]$$

$$y_{22} = \frac{1}{r_{ds}} = g_{ds} = \lambda_p I_D$$

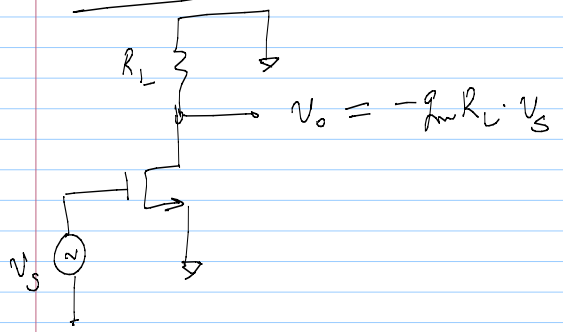




Same as that for NMOS

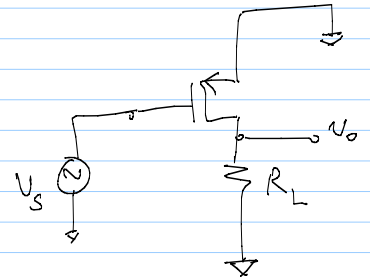
Common-Source Amp.

NMOS



$$\frac{v_o}{v_s} = -g_{m_n} R_L$$

PMOS



$$\frac{v_o}{v_s} = -g_{m_p} R_L$$