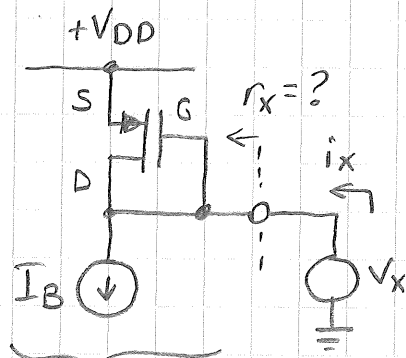
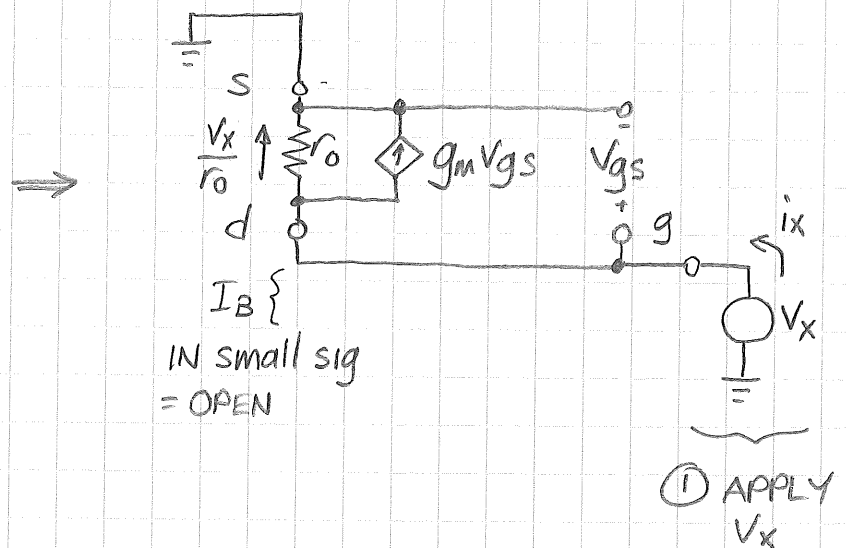


SMALL SIGNAL RESISTANCE OF DIODE CONNECTED MOSFET



REPLACE WITH
SMALL SIGNAL
MODEL

V_{DD} IN small sig = 0V



"IMPEDANCE AT A NODE" PROCEDURE

- ① APPLY V_x ② CALCULATE i_x ③ $r_x = \frac{V_x}{i_x}$

② KCL AT GATE

$$i_x = g_m V_{gs} + \frac{V_x}{r_o}$$

$$i_x = g_m V_x + \frac{V_x}{r_o} = V_x \left(g_m + \frac{1}{r_o} \right)$$

KVL AROUND GATE: $V_{gs} = V_x$

③ $r_x = V_x / i_x$

$$\frac{V_x}{i_x} = \frac{1}{g_m + \frac{1}{r_o}} = \frac{1}{g_m} \parallel r_o \quad \text{USUALLY } r_o \gg \frac{1}{g_m}$$

$$r_x \approx \frac{1}{g_m}$$

SMALL SIGNAL MODEL FOR
DIODE CONNECTED MOSFET
(NMOS OR PMOS) IS $1/g_m$:

