5.18 $V_{tn} = 0.5$ V

$k_n' \frac{W}{L} = 0.1$ mA/V^2

Saturation mode

$v_{DS} \geq (v_{GS} - V_{tn})$

for $i_D = 12.5$ μA

$v_{GS} = 1.0$ V and $v_{DS} \geq 0.5$ V

for $i_D = 50$ μA

$v_{GS} = 1.5$ V, and $v_{DS} \geq 1.0$ V

5.19 given $i_D = 0.4$ mA, $v_{GS} = v_{DS} = 2$ V,

$\therefore$ Sat. mode

given $i_D = 0.1$ mA, $v_{GS} = v_{DS} = 1.5$ V,

$\therefore$ Sat. mode

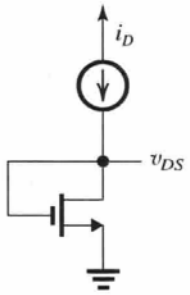
find k_n and V_t

$$\frac{i_{D1}}{i_{D2}} = \frac{0.4}{0.1} = \frac{(2 - V_t)^2}{(1.5 - V_t)^2}$$

sol $V_t = 1$ V.

$$k_n = \frac{2i_D}{(v_{GS} - V_t)^2} = 0.8 \text{ mA/V}^2$$

5.26



$$v_{DS} = v_{GS}$$

$$i_D = \frac{1}{2}k_n(v_{DS} - V_t)^2$$