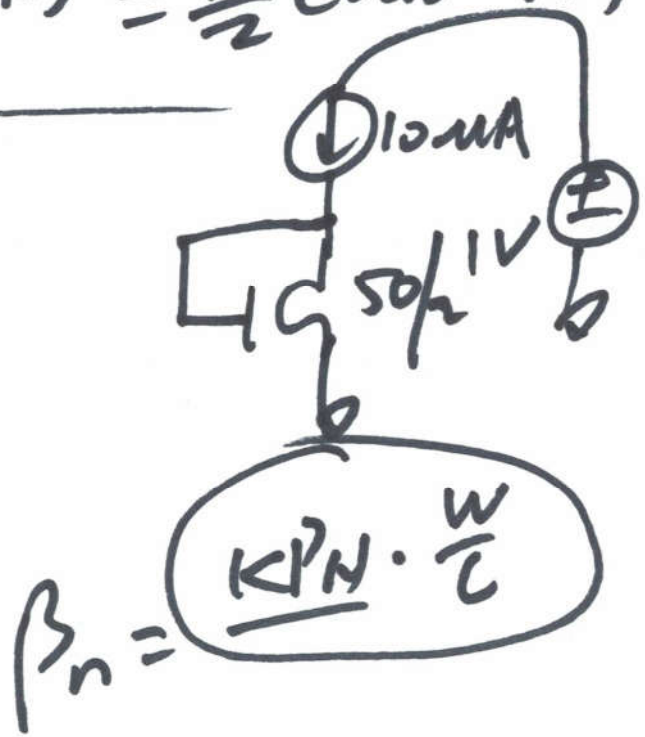
4.6 ① $I_{DN} = \frac{120\mu}{2}\frac{5^0}{2}(V_{GS}-V_{THN})^2 = \frac{\beta_n}{2}(V_{GS}-V_{THN})^2$



$$V_{GS} = \sqrt{\frac{2I_{DS}}{\beta_n}} + V_{THN}$$

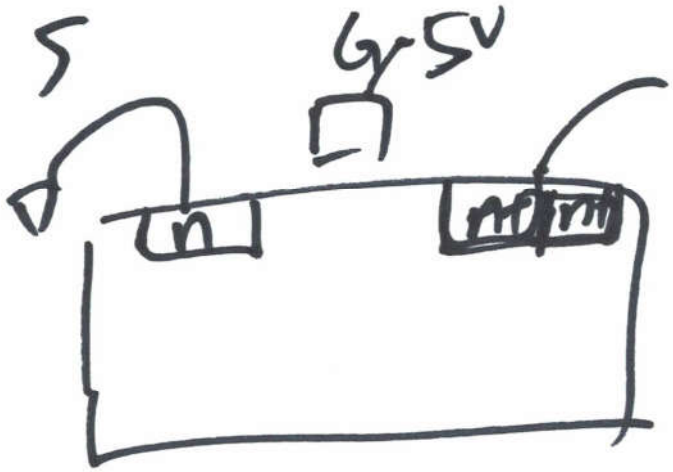
$$= \sqrt{\frac{2 \cdot 10\mu}{3000\mu}} + 0.8$$

$$= \sqrt{\frac{20\mu}{3000\mu}} + 0.8$$

$$= 0.08 + 0.8$$

$$= 0.88V$$

①



$C_5 : 20V$

$V_{THP} = 0.9$

$V_S = 1$

$V_G = 0.05V$

$V_{SG} = V_S - V_G = 0.975V - 0.9V$

$I_{DM} = \frac{K_P}{2} \frac{W}{L} (V_{SG} - V_{THP})^2$

$V_{SG} = \sqrt{\frac{2 \cdot I_{DM}}{\beta_P}} + V_{THP}$

$\beta_P = \frac{K_P \cdot \frac{100}{2}}{2} = 40M \cdot 50$

$= 2000\mu$

$V_{SG} = \sqrt{\frac{20M}{2000M}} + V_{THP} = 0.1 + 0.9$

$= 1V$