GIVEN: A) $V_{GS} = -5V$ $V_{BS} = 0$ $V_{TP} = -0.7V$

B) $V_{GS} = +5V$ $V_{BS} = 0$ $V_{TN} = 0.7V$

FIND: W/L RATIO FOR 2KΩ

SOLN: A)

$$\frac{W}{L} = \frac{1}{K_p' \left| V_{GS} - V_{TP} \right| R_{ON}}$$

$$= \frac{1}{\frac{40\mu A}{V^2} (4.3)(2k)} = \frac{2.91}{1}$$

B)

$$\frac{W}{L} = \frac{1}{100(4.3)(2k)} = \frac{1.16}{1}$$

TOPS 35500

GIVEN: $V_{BS} = 4V$ $V_{GS} = -1.5V$ $V_{DS} = -4V$

PMOS

$W/L = 25/1$

FIND: I_D & REGION OF OPERATION

SOLN:

$$V_{TP} = -0.75 - 0.5\left(\sqrt{4+0.6} - \sqrt{0.6}\right)$$
$$= -1.44\,V$$

$$V_{GS} - V_{TB} = -1.5 - (-1.44) = -0.065$$

$V_{DS} = -4$ SO SATURATION.

$$I_D = \frac{40}{2}\left(\frac{25}{1}\right)(-1.5+1.44)^2 = 1.8\mu A$$

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GIVEN: $W = 10\mu m$ $L = 0.25\mu m$

A) $t = 50\,nm$ B) $20\,nm$ C) $10\,nm$ D) $5\,nm$

FIND: C_{ox}'' AND C_{GC}

SOLN:

A) $$C_{ox}'' = \frac{\varepsilon}{t} = \frac{3.9\,(8.854\times10^{-14})}{50\times10^{-9}\,(100\,cm/m)}$$

$$= 6.9\times10^{-8}\ F/cm^2$$

$$C_{GC} = C_{ox}''\,WL = 6.9\times10^{-8}\,(10\times10^{-4}\,cm)\,(0.25\times10^{-4}\,cm)$$

$$= 1.73\times10^{-15}\ F$$

B) $$C_{ox}'' = 6.9\times10^{-8}\left(\frac{50}{20}\right) = 1.73\times10^{-7}$$

$$C_{GC} = 4.32\times10^{-15}\ F$$

C) $$C_{ox}'' = 6.9\times10^{-8}\left(\frac{50}{10}\right) = 3.45\times10^{-7}$$

$$C_{GC} = 8.63\times10^{-15}\ F$$

D) $$C_{ox}'' = 6.9\times10^{-8}\left(\frac{50}{5}\right) = 6.91\times10^{-7}$$

$$C_{GC} = 17.3\times10^{-15}\ F$$

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