1) A PMOS transistor has a threshold voltage (V_t) of $-3V$ & gate-to-source (V_{gs}) voltage of $-5V$.

Calculate the drain current (I_d) and the transconductance (g_m) of the PMOS.

Given :-

- $V_{DS} = 10V$
- $\mu_p C_{ox} = 100 \mu A/V^2$
- $W/L \Rightarrow 4/0.5$
- Region of operation :- linear Region

2) A PMOS transistor with a threshold voltage (V_t) of $-4V$ and $V_{DS} = 8V$. Calculate the (W/L) ratio of the PMOS transistor if the drain current is 2mA.

Ques If PMOS and NMOS transistors with same device geometry and bias voltages are employed in an identical configuration then which transistor would typically exhibit a lower drain current and why?

Ques What is the effect of temperature on the threshold voltage of PMOS and NMOS transistors. How does it influence its performance characteristics

Ques How do PMOS and NMOS transistors differ in terms of their switching speeds and power dissipation? Explain the reasons behind these differences.

Ques For a n-channel MOSFET with gate oxide thickness of 10nm.

$\mu_n = 200 cm^2/V.s.$

$V_G = 5V$

$V_T = 0.6V$

$W = 25 \mu m$

$L = 1 \mu m$

Calculate the drain current at

(i) $V_G = 5V$ & $V_D = 0.1V$

(ii) $V_G = 3V$ & $V_D = 5V$

Also discuss what happen for $V_D = 7V$

↳ Answers:

(i) $I_D = 7.51 \times 10^{-4} A$

(ii) $I_D = 4.97 \times 10^{-3} A$

An n-channel MOS transistor is made on a p-type Silicon Substrate with $N_a = 5 \times 10^{15}/cm^3$. The oxide thickness is 100Å in the gate region of the MOS transistor.

- effective interface charge density $(Q_i) = 4 \times 10^{10} qC/cm^2$

find
- C_{ox}
- Flat Band Voltage (V_{FB})
- Maximum depletion width (W_m)
- Total charge density (Q_d)
- Threshold voltage (V_T)
- Depletion Capacitance (C_d)

Ans

- $C_{ox} = 3.45 \times 10^{-7} F/cm^2$
- $V_{FB} = -0.969V$
- $W_m = 0.415 um$
- $Q_d = -3.32 \times 10^{-8} C/cm^2$
- $V_T = -0.215V$
- $C_d = 2.5 \times 10^{-8} F/cm$