

ECE 441 (Spring 2009) HW #11
Due: **Friday, April 24th, 2009**

1. Muller & Kamins 8.7.
2. Muller & Kamins 8.11.
3. See next page.

Problem 2: MOS System

The $C-V_G$ characteristics of a MOS capacitor with p-substrate is shown in Figure 2 with the equivalent capacitance circuit.

- 1 a) Calculate the oxide thickness x_{ox} .
- 2 b) Calculate the depletion width at inversion x_{dmax} .
- 3 c) Calculate the flat band voltage V_{FB} .

Useful formula:
$$\begin{cases} V_T = V_{FB} + 2|\phi_p| + \frac{1}{C_{ox}} \sqrt{4 \epsilon_0 \epsilon_s q N_a |\phi_p|} \\ 2|\phi_p| = \frac{q N_a x_{dmax}^2}{2 \epsilon_0 \epsilon_s} \end{cases}$$

$\epsilon_0 \epsilon_{si} = 1.04 \times 10^{-10} \text{ F/m}$ $N_a = 10^{15}/\text{cm}^3$

$\epsilon_{si}/\epsilon_{ox} = 3$

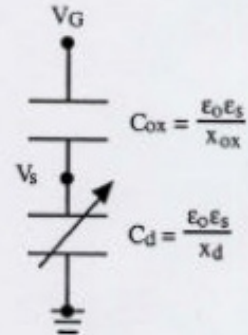
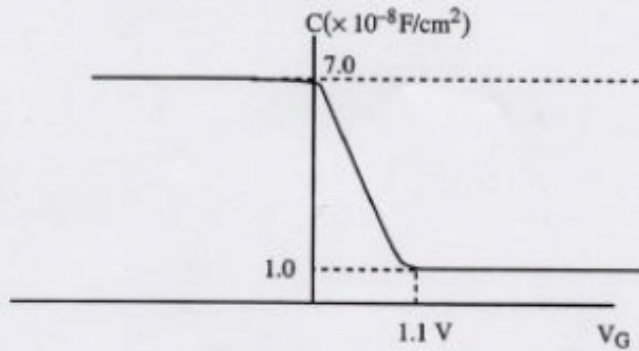


Figure 2