ECEn 450, Winter 2010
Homework # 12
Due March 30, 5:00 pm

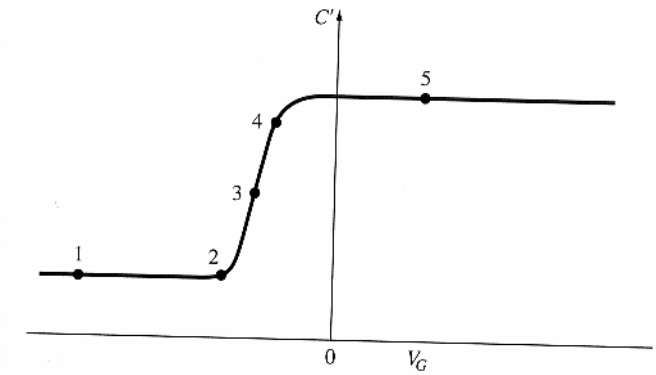
From the text Semiconductor Devices, Physics and Technology, do the following problems:

Chapter 6, problems 15, 18, 19

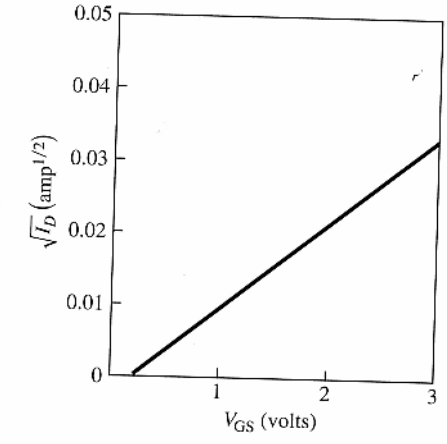
Chapter 12, problem 6

Also complete the following problems:

12.1 Consider the high-frequency C-V plot shown in the figure below. (a) Indicate which points correspond to flat-band, inversion, accumulation, threshold, and depletion mode. (b) Sketch the energy band diagram in the semiconductor for each condition.



12.2 The experimental characteristics of an ideal n-channel MOSFET biased in the saturation region are shown in the figure below. If W/L = 10 and t_{ox} = 425 Angstroms, determine V_T and μ_n.



12.3 One curve of an n-channel MOSFET is characterized by the following parameters: $I_D(sat) = 2 \times 10^{-4}$ A, $V_{DS}(sat) = 4$ V, and $V_T = 0.8$ V.

(a) What is the gate voltage?
(b) What is the value of the conduction parameter?
(c) If $V_G = 2$ V and $V_{DS} = 2$ V, determine I_D.
(d) If $V_G = 3$ V and $V_{DS} = 1$ V, determine I_D.
(e) For each of the conditions given in (c) and (d), sketch the inversion charge density and depletion region through the channel.