

**Problem Set #3**

Assigned: September 22, 2000

Due: September 29, 2000 at recitation

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<b>Reading Assignments:</b>	09/19/00	Sections 3.1-3.3 of Howe & Sodini
	09/21/00	Sections 3.3-3.6 of Howe & Sodini
	09/26/00	Sections 3.7-3.8 of Howe & Sodini

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PLEASE WRITE YOUR RECITATION SESSION TIME ON YOUR PROBLEM SET SOLUTION

**Problem 1.** [15 points]      Problem E3.12 of Howe and Sodini**Problem 2.** [15 points]      Problem E3.14 of Howe and Sodini**Problem 3.** [15 points]      Problem E3.15 of Howe and Sodini**Problem 4.** [15 points]      Problem P3.6 of Howe and Sodini**Problem 5.** [20 points]      Problem P3.8 of Howe and Sodini**Problem 6.** [20 points]

Voltage controlled oscillators are used in most RF circuits to select a particular frequency to receive. They are made with tank circuits where the inductor value is fixed and the capacitor value is controllable by changing the voltage. Pn junction diodes are often used for these circuits.

- Given an inductance of 1 nH and a pn junction diode with  $N_a = 10^{16} \text{ cm}^{-3}$  and  $N_d = 10^{19} \text{ cm}^{-3}$  calculate the area of the capacitor to make the resonant frequency 2.4 GHz when the voltage across the diode is 0 V.
- If the maximum electric field in the junction before breakdown is  $5 \times 10^5 \text{ V/cm}$  what is the maximum voltage that can be placed across the diode?
- Plot the range of frequencies that can be tuned with the range of tuning voltages from 0 V to the voltage calculated in (b).

