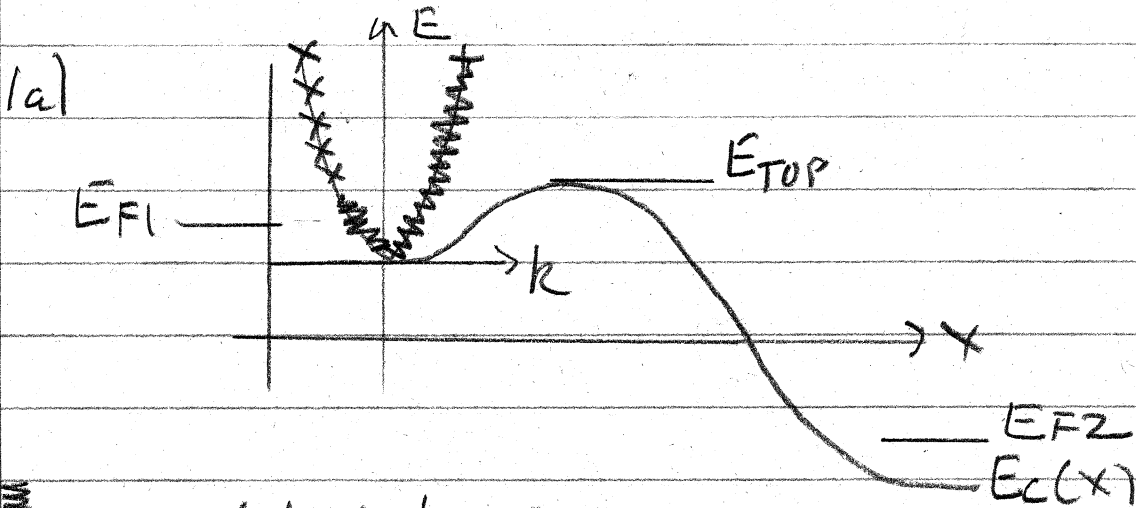


ECE 656: Fall 2009
Lecture 13 Homework SOLUTION

- 1) The suggested exercise on slide 31 of Lecture 13 asks how the states are occupied in the source of a ballistic MOSFET. Answer the following two questions.
 - 1a) Draw a sketch like that in slide 31 but illustrate how the states in the $E(k)$ are occupied from contact 1 (left) or contact 2 (right).
 - 1b) Give analytical expressions for the local density of states in the source. Assume a 2D density of states and express your answer in terms of E_{TOP} , then energy at the top of the barrier.

HW13 Solution



populated by E_{F1}

populated by E_{F2}

(b)

the 1D DOS for $+k$ is $D_{1D} = \frac{L}{\pi \hbar} \sqrt{\frac{2m^*}{(E - E_C(x))}}$

for contact ①:

$$D_{1D}^{①} = \frac{L}{\pi \hbar} \sqrt{\frac{2m^*}{(E - E_C)}} \quad E < E_{TOP}$$

$$D_{1D}^{②} = 0 \quad E < E_{TOP}$$

$$D_{1D}^{①} = \frac{L}{2\pi \hbar} \sqrt{\frac{2m^*}{(E - E_C)}} \quad E > E_{TOP}$$

$$D_{1D}^{②} = \frac{L}{2\pi \hbar} \sqrt{\frac{2m^*}{(E - E_C)}} \quad E > E_{TOP}$$