HW 4
EE-230: Due 4/14/2009

1. (EX 8.1) Assuming a 1D lead and one band effective mass model show that surface green function, g^R=-exp(ika)/to where t0 is the coupling between nearest neighbors.

2. (Ex 8.5) Consider a linear conductor with repulsive potential $U(x)=U_0\delta(x)$. Calculate the local density of states (LDOS) as a function of x at E=0.005 eV and E =0.05 eV. Use a one band tight binding model with 101 lattice points spaced by a=0.25 nm assuming U_0=5 eV and an effective mass of 0.25m. Plot your results.

3. Using the code in the back of the book, calculate (i) the transmission (ii) the current for the resonant tunneling device shown in Fig. 9.5.4 by changing the thicknesses of the left and right barrier within 1 nm to 5 nm (a) symmetrically (same width for both barriers) (b) different width for two barriers. Explain the behavior of transmission and current due to these changes.

4. Assuming Γ1=0.1 eV ; Γ2=0.2 eV; Γ3=0.3 eV; Γ4=0.4 eV and ignoring the real part of the self energy find out the four-probe current (μ3-μ4)/eI. Assume μ1=0.5 eV, μ2=0. Also for simplicity assume that the whole device can be described by just one energy level, ε=0.1 eV.