COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering

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Course Title: Advanced Devices Fall 2014

Course No.: EC738 Sheet 6

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MOSFET Scaling

For a certain NMOS technology, the device parameters are:
$\mathbf{u_0}$ = 1.35x10^{-2} m^{2}V^{-1}sec^{-1}, v_{sat} = 1.3x10^{5}m/sec, n = 2 for mobility equation.
t_{ox} = 3nm, N_A = 9x10^{17} cm^{-3}, x_j= 35nm, Gate workfunction = 4.05 eV.
Assume: $L_{metallurgical} = L_{gate} - 2*0.3*xj$

Question 1

a) Scale the transistor from L_{gate}=200nm and V_{ds}=1.3V down to L_{gate}=150nm. Find the new device dimensions, doping, and maximum supply voltage

b) Compare the following parameters with those of the initial device (found in sheet 5), using the new Vds=Vgs
   i. Depletion widths at source, drain, and in the middle of the channel for a long channel transistor
   ii. Long channel threshold voltage
   iii. Short channel threshold voltage (using 2D model)
   iv. Subthreshold current
   v. Drain current

c) Check if the parameters in1b follows the ideal *Constant Field* scaling