EE 436 — Spr 2020 — HW set 1   Name_____

Homework J4

In a linearly-graded junction, the doping varies linearly from one constant value on the *n*-side to another constant value on the *p*-side. This is essentially case (b) from Problem J2. Consider a linearly-graded junction made with GaAs. The graded region extends from an *n*-type doping level of $N_D = 5\text{x}10^{16}$ cm^{-3} to a *p*-type level of $N_A = 5\text{x}10^{16}$ cm^{-3}. The intrinsic region that is 0.5-μm wide.

First sketch the band diagram, charge density profile, and electric profile at equilibrium. Then calculate the following,

The key to the problem is to assume that the graded layer will be completed depleted. Use your sketches to help with the calculations.

$\phi_{bi} =$ _____

$\mathscr{E}_{max} =$ _____

$C_j =$ _____

$J_{NS} =$ _____

$J_{NP} =$ _____

Put your answers — and whatever work will fit — on this sheet. Staple any sheets with additional work behind.