PRACTICE TEST 1 ANSWER KEY

1.1 4.5

1.2 5.0

2 8.59

3.1 donors

3.2 answer is 1.1e17 to compensate the background Na and obtain desired n

3.3 0.1

4 The 1V side acts as source of electrons, Current flows from 5V to 1V

5.1 answer is 0.8V, the turn-on voltage of the junction given

5.2 1.3

5.3 see our Onenote "old test" in the test 1 section for a drawing. IB is zero between 0 and 0.8V, the turn-on, then it increases linearly as IB=(Vin-Vbe)/Rb

5.4 find Ic, then divide it by Ib, this is in saturation it turns out, 31.25

6.1 -4.5

6.2 The current is limited to mA range typical for LED operation

6.3 1.5

6.4 1.5

7.1 4.3

7.2 -10.7

7.3 -14.27

8.1 100

8.2 2.0

9 see our notes for a PNP design example. We also have this in the "old test 1" in Onenote.

10.1 Vin=0V, NMOS is off, PMOS must have same current, zero A, because PMOS Vgs=-Vdd, it is on, only possible Vout is Vdd, which makes VDS=0 so that PMOS current is equal to Nmos current. Supply current is 0.

10.2 Vout=0V, currents are both 0. VGS,pmos=0V, so PMOS is off. VGS,nmos=5V, so NMOS is on, to have zero current, NMOS VDS has to be zero, so Vout=0V.

10.3 for numerical example, see our "old test1" or our notes.

11.1 for intrinsic caps, when VGS=VDS=VDD, transistor is in saturation, Cgs is 3/2*Cgc, Cgd is zero, so Cgs is larger than Cgd.

11.2 extrinsic Cgs and Cgd are proportional to width, extrinsic Cgb is proportional to length. See picture drawings in our notes for understanding why.

11.3 see the drawing in our notes, at zero Vds, Cgs is equal to half of 1/2 * Cox" * W * L.