Due June 2, Thursday

Problem 1 (30 points) Problem T3.12(b,e,f).

Problem 2 (30 points) Read and summarize (in a short one paragraph each) the core qualitative physics of the two reverse "breakdown" mechanisms, avalanche breakdown and Zener breakdown. Include a diagram for each. In particular, note which of these three RG mechanisms the avalanche breakdown mechanism corresponds to – photon-assisted band-to-band RG (a,d of Fig. T3.15), phonon-assisted R-G center mediated RG (b,e of Fig. T3.15) and Auger processes (c,f of Fig. T3.15). Research and find one practical device example that makes use of the avalanche mechanism. Note that "breakdown" does *not* mean a device damage.

Problem 3 (30 points) Consider the Sample Problem 1 of the textbook at page 124 (as we considered in lecture – see LN 13.1.1). With parameter values as given in the book, determined the quasi-Fermi levels for both the electron (F_N) and the hole (F_P) as a function of time, and make a sketch. Assume that the time resolution is poor relative to the dielectric relaxation time (LN 13, and HW 7.3), i.e. consider that dielectric relaxation time is zero.

Problem 4 (40 points) Problem T6.8.

Problem 5 (40 points) Problem T6.10.

Problem 6 (40 points) Problem T6.12.

Problem 7 (Extra Credit, 10 points) Problem T10.2.

Problem 8 (Extra Credit, 30 points) Problem T10.6.

Problem 9 (Extra Credit, 30 points) Problem T10.9.