UM-SJTU JI Summer 2019 VE 320 Quiz 5

Name: Student ID:

1. What are the mechanisms for pn junction breakdown at large reverse bias? Describe the physical origins using your own words.

2. Consider a GaAs pn junction diode at $T = 300$ K with parameters $N_d = 8 \times 10^{16}$ cm^{-3}, $N_a = 2 \times 10^{15}$ cm^{-3}, $D_n = 207$ cm^2/s, $D_p = 9.80$ cm^2/s, and $\tau_0 = \tau_{p0} = \tau_{n0} = 5 \times 10^{-8}$ s. (*a*) Calculate the ideal reverse-biased saturation current density. (*b*) Find the reverse-biased generation current density if the diode is reverse biased at $V_R = 5$ V. (*c*) Determine the ratio of J_{gen} to J_s. Please provide the process of derivation.