

UM-SJTU JI Summer 2019 VE 320 Quiz 6

Name:

Student ID:

1. For an npn BJT, what are the cutoff mode, forward active mode, and saturation mode of operation? Please describe using your own words.

2. Assume a silicon npn bipolar transistor at $T = 300$ K has the following minority carrier parameters: $D_E = 8$ cm²/s, $D_B = 20$ cm²/s, $D_C = 12$ cm²/s, $\tau_{E0} = 10^{-8}$ s, $\tau_{B0} = 10^{-7}$ s, and $\tau_{C0} = 10^{-6}$ s. $\alpha_T = \delta = 0.9967$, $x_B = x_E = 1$ μ m, $N_B = 5 \times 10^{16}$ cm⁻³, and $N_E = 5 \times 10^{18}$ cm⁻³. Determine the common-emitter current gain β . Please provide the process of derivation.