ECE 3030 Spring 2025 Hints

1. Calculate width x_{n0} on n-side with V plus reverse voltage Vr. Is the base width narrowing significant.
2. Use S&B Fig. 7-7(a) caption to define and calculate M1 and M2. Lecture 35, slide 13.
3. Indicate relative size of all electron and hole flows by arrow widths. Reverse of Lecture 34, slides 15 and 17.
4. (a) Use μ_p^n to calculate D_p and then L_p and finally, W_b/L_p. Assume $\gamma \sim 1$. From slide 16, Lecture 35 or S&B Eq. 7-18(a), 18(b), and 19, with $\Delta p_C \simeq 0$, obtain I_E. Note that $I_C = \text{sech}(W_b/L_p)$. (b) Use S&B Eq. 7-19 or Charge Control Approximation, Lecture 35, slide 10.
5. For B, use S&B Eq. 7-26 and Table 7-1 expansion. For γ, use Solution, Example 7-3, p.367 and the Table 7-1 expansion. The Charge Control approximation for $\beta \sim I_C/I_B$ in Eq. 7.20 (b) and (c) also yields β as τ_p/τ_t (Eq. 7-76) and $\tau_t = W_b^2/2\,D_p$. Solve for β using τ_p from Problem 4. See also Lecture 37, slide 16.
6. See Lecture 36, slide 8 for Q_p. $\tau_t = W_b^2/2\,D_p$. Solve for $f_T = 1/2\pi\,\tau_t$.
7. Want δp high at emitter and as close to zero at collector.