Part A

1)  \( N_0 = 10^{16} \text{ cm}^{-3} \) \( \Rightarrow \) N-Type

\[ N_0 = N(x) = N_b \]

\[ P = N - N_b \]

\[ B = \frac{N_e}{N_b} \]

\[ N_0 = N(x) = N_b \]

\[ P_0 = \frac{dP}{dx} \]

\[ N_0 = N_b \]

Part B

1) Because it is "depleted" of carriers \( \Rightarrow \) There are no carriers present

2) Transit time

3) False

4) \( p + n \) \( \Rightarrow \) \( N_0 + N_b \) \( \Rightarrow \) \( x_p \ll x_n \) \( \Rightarrow \) \( W \approx x_n \)

\[ V = -\frac{E}{q} \]

\[ \xi = -\frac{dV}{dy} \]

\[ \text{change} = \frac{d\xi}{dx} C_{Si} \]
Part C

- Breakdown, Reverse Bias, and Forward Bias
- Ideal, Constant Voltage Drop, and Exact
\[ D = \text{Exact DC Diode Model} \]
\[ R_s = \text{Parasitic series resistance} \]
\[ C_d = \text{Depletion capacitance} \]
\[ \text{(dominant while in } \text{Forward Bias)} \]
\[ C_b = \text{Diffusion capacitance} \]
\[ \text{(dominant during } \text{Forward Bias)} \]
\[ R_s = \text{Small-signal } \]
\[ \text{resistance (dominates } \text{I-V relationship of the diode when processing small signals)} \]