Homework # 8 Solutions

4.1) $I_c = \beta I_b$ in the linear active (plateau) region

At $V_{ce} = 6V$, use the plot to estimate

$$\frac{\Delta I_c}{\Delta I_B} \sim \beta$$ (spacing between the plateaus)

At $I_b = 10\mu A$, taking the nearest two curves.

$$\frac{\Delta I_c}{\Delta I_b} = \frac{I_c(15\mu A) - I_c(5\mu A)}{15\mu A - 5\mu A} \sim \frac{3mA - 1mA}{10\mu A} = 200 \sim \beta$$

(Just by eyeball - you could be more careful)

At $I_b = 20\mu A$, $\frac{\Delta I_c}{\Delta I_B} = \frac{4.8mA - 3mA}{10\mu A} = 180 \sim \beta$

At $I_b = 30\mu A$, $\Delta I_c = \frac{6.8 - 4.8mA}{10\mu A} = 200 \sim \beta$

When $I_b = 30\mu A$, for $V_{ce} = 4V$,

$$\frac{\Delta I_c}{\Delta I_b} \sim \frac{6mA - 4.4mA}{10\mu A} = 160$$

for $V_{ce} = 2V$

$$\frac{\Delta I_c}{\Delta I_b} \sim \frac{5.4mA - 3.7mA}{10\mu A} = 170$$

for $V_{ce} = 8V$

$$\frac{\Delta I_c}{\Delta I_b} \sim \frac{7.5mA - 5.5mA}{10\mu A} = 200$$

This eyeballing has large error bars, but β is not exactly constant.