For the circuit below, $I_b$ must be 0.5 mA to ensure saturation. In LED must have 20 mA of current through it to light properly. When illuminated, the LED has 2V across it as shown.

Determine:
(a) $R_b$
(b) $R_e$

$\beta = 100$

$V_{cc} = 5V$ when saturated

$V_b = 0.7V$

$I_b = 0.5 mA$

$I_e = 20 mA$

\[ V_{VH1} = -5 + 2.6R_b + 0.7 = 0 \]

\[ V_{VH2} = -2.2 - 20mA R_e + 0.7 = 0 \]

\[ -5 + 0.5mA R_b + 0.7 = 0 \]

\[ 6.5 = 20 - 2R_e \]

\[ R_b = 8600 \Omega \]

\[ R_e = 325 \Omega \]