Problem 1 – Wiring and Resistor Sizing
(15 pts)

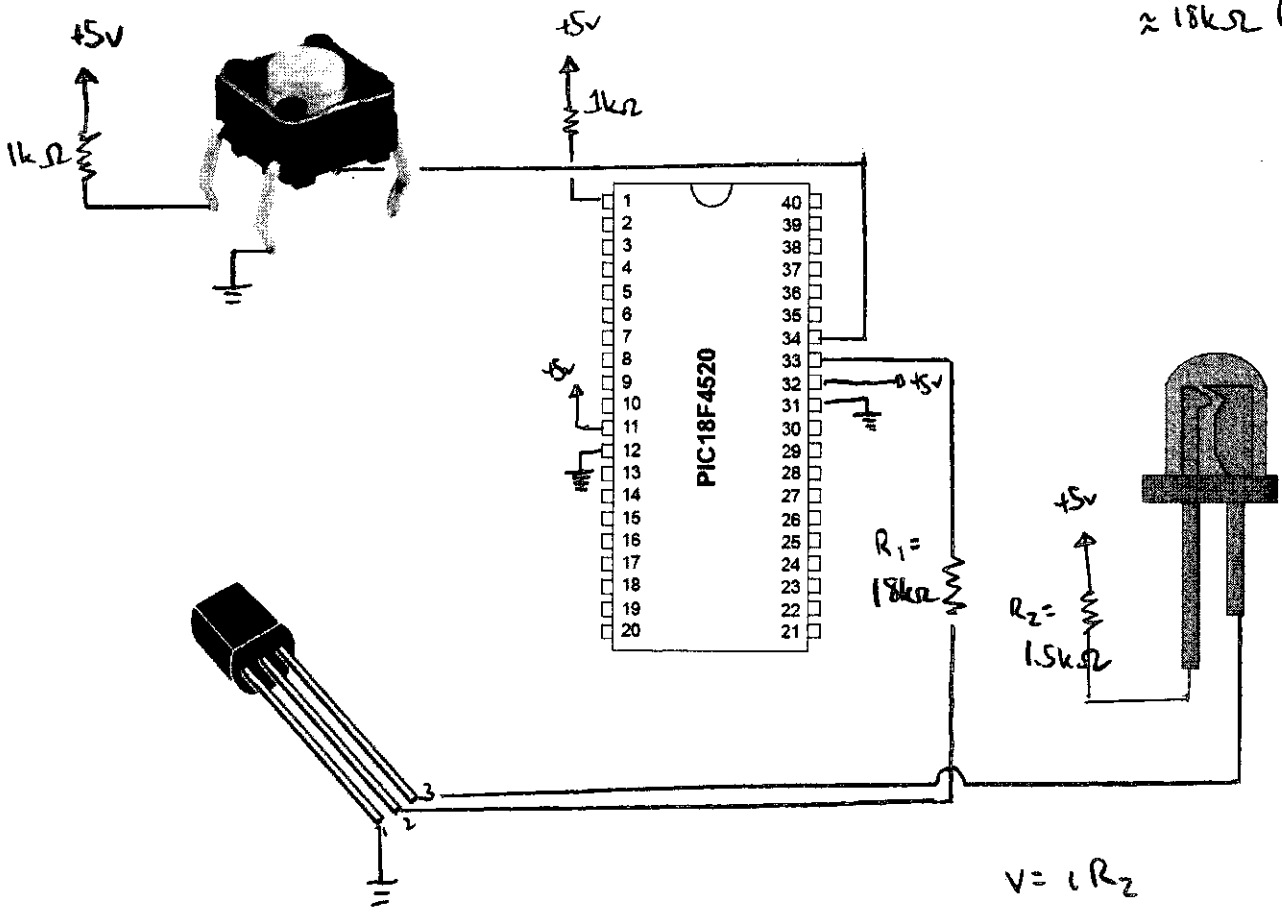
Please draw a circuit diagram to control an LED using a pushbutton and NPN transistor. Show all resistor sizes necessary with clear labels (showing your work may help with partial credit). Assume the LED is different from the ones we use in class and has a maximum current of 6 mA so we will target using 3 mA of current. Additionally the LED has a 0.7 volt forward voltage drop. The PIC is programmed for RB0 to be an output controlling the LED and RB1 to be an input for the basic switch circuit. The only power source is 5 volts (show power/ground for PIC as well). Use real resistor sizes.

$V = iR_1$

$5 = \left(\frac{1}{10} \cdot .003\right) R_1$

$R_1 = \frac{5}{.0003} = 16{,}667\,\Omega$

$\approx 18k\Omega$ (or 15 or 16 or 22)



$V = iR_2$

$(5 - 0.7) = (.003) R_2$

$R_2 = \frac{4.3}{.003} = 1.43\overline{3}\,k\Omega \approx 1.5k\Omega$