HW 4.1

Sunday, February 16, 2020 4:53 PM

1) a) $2^{10} = 1024 - 1 = 1023$

$$\frac{2V}{5V} \cdot 1023 = 409.8$$

b)

$$error = z_{target} - z_{actual}$$

$$V_{motor} = k_p \cdot error$$

$$V_{motor} = k_p \cdot (z_{target} - z_{actual})$$

$$z_{actual} = z_{target} - \frac{V_{motor}}{k_p}$$

$$V_{motor} = \sqrt{\frac{F_{lift}}{B}}$$

$$F_{lift} = \sqrt{0.800 \cdot 9.8 \frac{m}{s^2}} = 0.72 m/s$$

$$z_{actual} = z_{target} - \frac{0.72}{k_p}$$

c)

$$10_m - \frac{0.72}{2.0} = 9.64_m$$

d) Ideally, to eliminate error, one would want k_p to be as big as possible but it is impossible to have a k_p that is ∞ so there will always be some steady-state error.