Prelab 5

2.2

Resistance A-B $= \dfrac{1}{\frac{1}{R_1+R_2}+\frac{1}{R_3+R_4}} = \dfrac{1}{\frac{1}{2R}+\frac{1}{2R}} = \boxed{R}$

Resistance A-C $= \dfrac{1}{\frac{1}{R_3}+\frac{1}{R_1+R_2+R_4}} = \dfrac{1}{\frac{1}{R}+\frac{1}{3R}} = \dfrac{1}{\frac{4}{3R}} = \boxed{\frac{3}{4}R}$

ΔV

$R_1 = R_4 = (1+\varepsilon \cdot GF)\cdot R$

$R_2 = R_3 = (1-\varepsilon \cdot GF)\cdot R$

$R_{AB} = \dfrac{1}{\frac{1}{R_1+R_2}+\frac{1}{R_3+R_4}} = \dfrac{1}{\frac{1}{2R}+\frac{1}{2R}} = R$

$I_{cell} = V_S/R$

$V_{AD} = (1+\varepsilon \cdot GF)\cdot R \cdot \frac{1}{2}\cdot \frac{V_S}{R} = \frac{1}{2}(1+\varepsilon \cdot GF)\cdot V_S$

$V_{AC} = (1-\varepsilon \cdot GF)\cdot R \cdot \frac{1}{2}\cdot V_S/R = \frac{1}{2}(1-\varepsilon \cdot GF)\cdot V_S$

$\Delta V = V_{AD} - V_{AC} = \frac{1}{2}(1+\varepsilon \cdot GF)V_S - \frac{1}{2}(1-\varepsilon \cdot GF)\cdot V_S$

$= \frac{1}{2}(2\varepsilon \cdot GF)V_S = \boxed{\varepsilon \cdot GF \cdot V_S} = \Delta V$

2.3

$\dfrac{2^{12}-1}{3.3V} = \dfrac{x}{3mV}$

$\dfrac{4095}{3300mV}\cdot 3mV = x$

$x = \dfrac{4095}{1100} \approx \boxed{4}$ ADC output

$\dfrac{3300mV}{4095}\cdot 1 = xmV = 0.806mV$

$\dfrac{0.806mV}{3mV} = \dfrac{yg}{1000g}$

$y = \boxed{268.62g}$ Resolution

2.3 cont

$V_{min} = 0V + 0.95V = \boxed{0.95V}$

$V_{max} = 3.3V - 0.9V = \boxed{2.4V}$

$min = max(0.95V, 100mV) = \boxed{0.95V}$

$max = min(2.4V, 1.8V) = \boxed{1.8V}$

Weight	Amplifier V_{out}
0kg	$V_{0kg} = \boxed{1.15V}$
1kg	$V_{1kg} = \boxed{1.6V}$

$G = 1.6V / 3mV = 1600mV / 3mV = \boxed{533.\overline{3}}$

$G = 5 + \frac{80k\Omega}{R_G}$

$533.3 - 5 = \frac{80k\Omega}{R_G}$

$R_G = \frac{80k\Omega}{533.3 - 5} = \boxed{151.43\Omega}$

Diagram