BME 386
PreLab 5 Solns

Total = 30 pts

① Auscultatory Technique: Sphygmomanometer + Stethoscope ← listen downstream from cuff

1) Inflate cuff above systolic pressure (no sound)
2) Slowly release pressure and listen for 1st Korotkoff sound } systolic pressure
3) Keep reducing pressure until you hear silence (5th Korotkoff sound) } Diastolic Pressure

② Oscillometric Technique: Pressure cuff + pressure sensor

↑ Does NOT give identical info as auscultatory technique.

1) Inflate cuff above systolic pressure
2) Slowly release pressure and detect oscillations
3) Cuff pressure at max oscillation peak is the mean arterial pressure (MAP)

③ Data sheet says: Sensitivity $\left(\frac{\Delta V}{\Delta P}\right) = \boxed{0.8\ mV/kPa}$

Supply voltage = $\boxed{10V = V_s}$

④

$$V_{MEAS} = A_d S P + V_{Ref}$$

S: $0.8\ \frac{mV}{kPa}$

Limited by ADC

At max pressure, want $V_{MEAS} = A_d S P_{MAX} + 1.5 < 5V$

$$P_{max} = 175\ mmHg \times \frac{101\ kPa}{760\ mmHg} = \underline{\underline{23.26\ kPa}}$$

$$A_d < \frac{5 - 1.5\ V}{0.8 \times 10^{-3}\ \frac{V}{kPa} \times 23.26\ kPa}$$

$$< \boxed{188.1}$$

⑤ For AD620, $A_d = 1 + \frac{49400}{R_G} < 188$

$$R_G > \frac{49400}{188 - 1} = 264\ \Omega$$

Choose $\boxed{R_G = 270\ \Omega}$

Actual gain $= 1 + \frac{49400}{270} = 183.96 \sim \boxed{184}$

(6) $V_{MEAS} = A_d S P + V_{Ref}$

$$\rightarrow P = \frac{V_{MEAS} - V_{Ref}}{A_d S} = \boxed{\frac{1}{A_d S}\left(V_{MEAS} - V_{Ref}\right)}$$

(7) ΔV_{ADC} vs. V_{noise}

$$\frac{5V}{2^{10}} = 4.88\,mV \quad \text{vs.} \quad 1\,mV$$

↑ Larger value is the limiting factor.

$$\Delta P_{MIN} = \frac{\Delta V_{ADC}}{\frac{\partial V_{MEAS}}{\partial P}} = \frac{\Delta V_{ADC}}{A_d S}$$

$$= \frac{4.88\,mV}{184 \times \frac{.8\,mV}{kPa}} = .033\,kPa$$

$$= .033\,kPa \times \frac{760\,mmHg}{101\,kPa}$$

$$= \boxed{0.25\,mmHg}$$