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Problem 1)

a) $1/f^2$ noise requires a whitening filter: CR filter ($f_P=f_C=1kHz$). Effect on signal: it removes the DC component. Matched filter on ten periods. $V_{P,MIN} = 14\mu V$.
b) Extend the measurement on a few seconds. Two suitable solutions: CDF+Ratemeter/Boxcar or LIA. Considering in all cases a weighting function that goes to zero in 2s, $V_{P,MIN} = 15.8nV$.
c) The sampler allows us to collect 2 samples per period: we can use them to implement a CDS for each period. The high-pass filtering action of the CDS provides a low frequency cut-off around 3.2MHz, that is well beyond f_C. Thus, only white noise is practically affecting the measurement. With a CDS+Ratemeter/Boxcar (same duration of the weighting function as in point b), $V_{P,MIN} = 63nV$.

Problem 2)

a) Wheatstone bridge, 4 strain gauges (G=2, R=100 Ohm): 2 active devices to isolate the bending component, two dummy sensors for temperature compensation. Overall noise at the input of the preamplifier: $\sqrt{S_V} = \frac{2.4\text{n}V}{\sqrt{Hz}}$. Constant power supply V_A=0.2V. LPF (f_P=1kHz) to limit the wideband noise. ε_{MIN}=0.48microstrain (comment: temperature compensation is necessary).
b) A zero setting limits the 1/f noise contribution. $f_{P,HPF,eq}=1/2\pi 3600s=44\mu Hz$. ε_{MIN}=1.38microstrain.
c) See theory. With f_{MOD}=10kHz and a LIA, in both cases (with proper sizing of the circuit/filter parameters) the same sensitivity of point a) can be obtained in both cases.