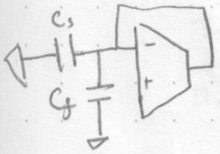
4) c) V_{os} - slow drift 1Hz sinusoid A = 1mV

For $A \to \infty$, input referred amplitude = 1mV

d) Noise charge V_x → thermal noise integrated on C_f & C_s



$$\overline{q_x^2} = kT(C_s + C_f)$$ - equipartition theorem

$$\overline{q_x^2} = k \cdot 300K \cdot 3pF = 1.24e^{-32}\ \overline{C^2} = \boxed{111\ aCrms}$$

e) $$N_{A_0} = \frac{\alpha 4kT\gamma \Delta f}{G_m} \cdot A_{CL}^2 \qquad A_{CL} = \frac{A}{1+A\beta} \Rightarrow \frac{1}{\beta} \qquad \beta = \frac{C_f}{C_s+C_f} = \frac{1}{3}$$

$$K = -\frac{C_s}{C_s+C_f} \qquad A_{CL} = \frac{K}{\beta} = -\frac{C_f}{C_s}$$

$$N_A = \frac{\alpha 4kT\gamma\Delta f}{G_m}\cdot\left(-\frac{C_f}{C_s}\right)^2$$

$$R_o = \frac{1}{\beta G_m} \qquad \overline{i_o^2} = \alpha \cdot 4kT\gamma G_m \Delta f$$

$$\frac{\overline{V_o^2}}{\Delta f} = \frac{\alpha 4kT\gamma}{\beta R}\cdot\left(\frac{R}{1+j\omega C_L}\right)^2$$

$$\overline{V_o^2} = \int_0^\infty \frac{\alpha 4kT\gamma}{\beta R}\left(\frac{R}{1+j\omega C_L}\right)^2 \Delta f\, df = \frac{\alpha kT\gamma}{\beta R}\cdot\int_0^\infty \frac{1}{R}\left(\frac{R}{1+j\omega C_L}\right)^2 \Delta f\, df$$

$$\overline{V_o^2} = \frac{\alpha kT\gamma}{\beta C_{Lt}} \qquad C_{Lt} = C_L \| C_f = C_L + C_f = 2pF + 1pF = 3pF$$

$$\overline{V_o^2} = \frac{1\cdot k\cdot 300K\cdot 3}{\frac{1}{3}\cdot 3pF} = 12.42\ mV^2 = \boxed{111.5\ \mu Vrms}$$

f) $$\overline{V_{o_1}^2} = \frac{\overline{q^2}}{C_f^2} = \frac{1.24e^{-32}\ \overline{C^2}}{1pF^2} = 12.42\ mV^2 = 111.5\ \mu Vrms$$

$$\overline{V_{o_{tot}}^2} = \overline{V_{o_1}^2} + \overline{V_{o_2}^2} = 2\overline{V_o^2} = 24.84\ \mu V^2 = \boxed{157.6\ \mu Vrms}$$

All of the charge error in the circuit will be forced to the output by the feedback action of the amplifier, regardless of CDS action.