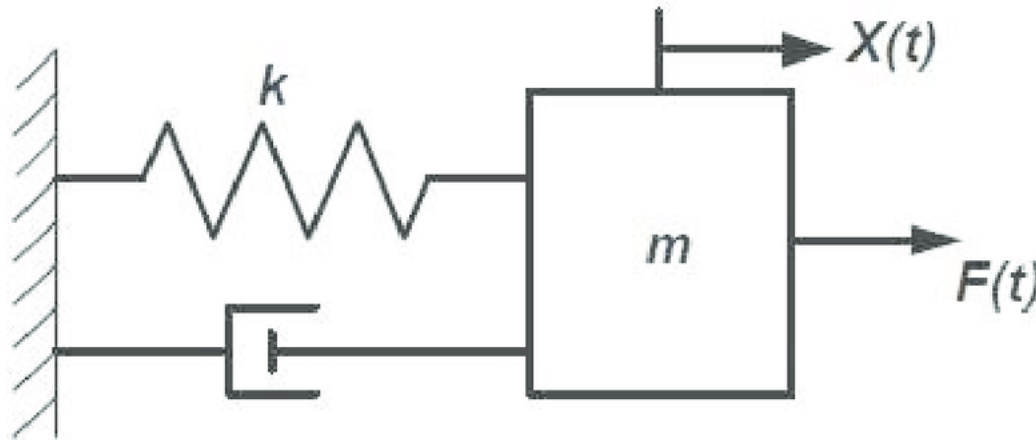# Exercise 1/2

- The fundamental mode of the resonant gravitational wave detector Auriga can me simplified to the following model

- We know that $m \simeq 1.3 \times 10^3 kg$. (The effective mass of the mode is approximately equal to half the true mass of the antenna).

- The resonant frequency is about $f_o \simeq 990\ Hz$, the Q factor is $Q \simeq 10^6$ and the temperature is $T = 2\ K$

- Calculate PSD and autocorrelation of $X(t)$ due to Brownian noise.

- Does the system obeys equipartition?

- Consider the following circuit and assume it at thermal equilibrium.

- Calculate the PSD of V.

- Calculate the PSD of I_L

- Calculate the autocorrelation of both quantities by using inverse Fourier transforms

- Check that equipartition of energy is obeyed

- Calculate the conditional probability of V(t) conditioned to $V(0)=V_o$

- Use L= 1mH, C= 0.25 μF, R=50 MΩ and T=293 K.