9. Black box (?? 1point) — *Jaan Kalda, Mihkel Heidelberg.* The black box has three terminal wires: “blue”, “black” and “white”, and contains in a star configuration: a battery, a capacitor, an inductor in series with a diode. You may consider the diode to be ”ideal” — it conducts current perfectly one way and not at all the other way. You may neglect internal resistance of the battery and capacitor, but the inductor has considerable internal resistance. The multimeter’s internal resistance when measuring voltages is $R_m = 10\,\mathrm{M\Omega}$ and it displays a new reading every $t = 0.4\,\mathrm{s}$.

i) *(3 points)* Draw the electrical circuit that is inside the black box. Motivate your solution with measurements.

ii) *(1 point)* Determine the electromotive force of the battery.

iii) *(1 point)* Determine the internal resistance of the inductor.

iv) *(3 points)* Estimate the value of the capacitance C.

v) *(3 points)* Estimate the value of the inductance L.

Equipment: Black box, multimeter, stopwatch.