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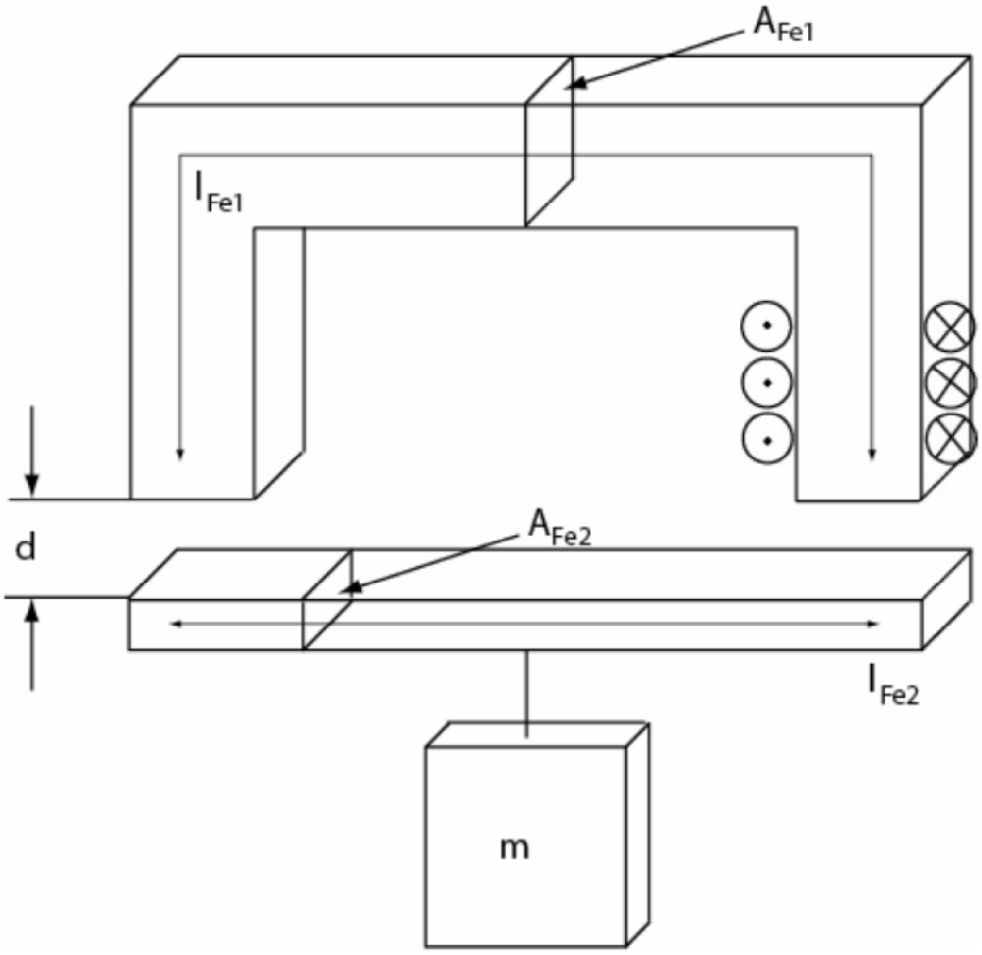
Exercise 3

The magnetic arrangement shows a winding of N = 50 turns over an iron core. A DC current of I = 10 A flows through the winding. As shown in the figure, an air gap of length d = 0.2 mm exists in the flux path. The following data holds true for the iron core.

l_{Fe1}= 15 cm, l_{Fe2} = 7 cm , A_{Fe1} = 4 cm^2, A_{Fe2} = 2 cm^2, μ_r = 4000



a) Draw a sketch showing the profile of the generated magnetic flux ϕ.
b) Draw the electrical equivalent of the magnetic circuit.
c) Calculate the magnetic flux density b_L and the magnetic flux ϕ_L in the air gap.
d) Plot the magnetic flux ϕ_L graphically as a function of gap length d.
e) Calculate the magnetic energy in the iron and air gap.
f) Calculate the mass m (shown in figure), which can maintain the arrangement.
g) Calculate the stiffness of the assembly.