

task_5efsj705cf97jxga_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

Exercise E7 Lorentz Force (written test, approx. 8 % of a 120-minute written test, SS2024)
..... 2

lorentz force, magnetic field, exam ee2 SS2024

Exercise E7 Lorentz Force

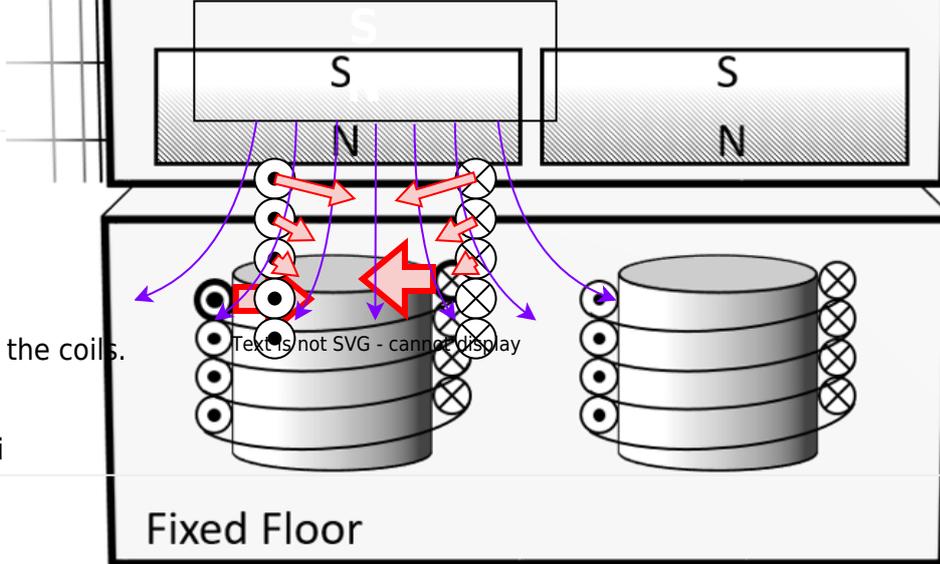
(written test, approx. 8 % of a 120-minute written test, SS2024)

2. Describe the resulting force on the left and right coils of the mobile shuttle in a homogeneous magnetic field of the fixed floor, if the current in the coils is $I = 1.6 \text{ A}$ and the magnetic field of the shuttle is $B = 0.5 \text{ T}$. (see image).

Result

Path

Since the resulting force has to be perpendicular to B -field and conductor, the force has to point to the left or the right.
 The Lorentz force can only have a lifting effect in an inhomogeneous field. In this case, the sum of the forces results in a repulsing force, see image. Beside boundary effects, the field gets also inhomogeneous, by the additional field of the coils.



- current $I = 1.6 \text{ A}$
- magnetic field of the shuttle is homogeneous with $B = 0.5 \text{ T}$

1. Calculate the magnitude of the resulting force on one coil!

Path

The Lorentz force on a conductor the length l and the current I in a B -field is

$$|\vec{F}_L| = I \cdot l \cdot B \cdot \cos(\angle \vec{B}, \vec{l})$$

$$= I \cdot (N \cdot 2\pi r) \cdot B \cdot \cos(\angle \vec{B}, \vec{l})$$

$$= 1.6 \text{ A} \cdot (500 \cdot 2\pi \cdot 40 \cdot 10^{-3} \text{ m}) \cdot 0.5 \text{ T} \cdot \cos 90^\circ$$

From:

<https://mexle.te.hs-heilbronn.de/> - **MEXLE Wiki**

Permanent link:

https://mexle.te.hs-heilbronn.de/ee2/task_5efsj705cf97jxga_with_calculation

Last update: **2024/07/15 21:37**

