

## Examination in Applied Electromagnetism 091023

All examination aids except those which provide contact with the outer world are allowed.

If numeric values are needed but not given, you may assume reasonable numbers!

1

Stray capacitance (unintended capacitance) is a problem that often needs to be controlled. What is the capacitance between two needlepoints with radius of curvature  $120\ \mu\text{m}$  at a distance of  $2.0\ \text{mm}$  from each other. Work in an approximation so that the capacitance can be calculated within an error margin of 50% (a little bit better than order of magnitude). You do not have to prove your approximation.

2

A ring charge produces a field which is zero in the middle of the ring, then increases along the axis of the ring to a maximum and then decreases. At what distance from the ring is the approximation of the ring as a point charge so good that it gives an error of less than 10%?

3-4

A particle starts from rest at the origin in a combined E- and B-field

$$\vec{E} = E\vec{e}_x \text{ and } \vec{B} = B\vec{e}_z$$

Calculate and sketch its trajectory if charge =  $q$  and mass =  $m$

5

Where at the ground is the horizontal component of the B-field from a double conductor strongest? Assume that the current is  $2,5\ \text{A}$  in each direction. The two conductors are at  $10\ \text{m}$  height and at  $0,50\ \text{m}$  distance from each other.

What is the horizontal B-field strength there?

6

Two infinitely long, parallel wires have equal charge but of opposite sign. They are parallel and situated  $1\ \text{cm}$  apart. What is the potential  $20\ \text{cm}$  from the positive one (and  $21\ \text{cm}$  from the negative)?  $\lambda = 4.0\ \mu\text{C}/\text{m}$

Calculate it by integrating the combined field from the two wires

Write your mail address on the envelope!!!