Universität Leipzig, Fakultät für Physik und Geowissenschaften

Exercises for Experimental Physics 2 – IPSP

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Exercise Sheet 11 (SoSe 2012)

Date of Issue: June 22nd 2012

Date of Submission: June 29th 2012

Submission Place: Marked mailbox next to room 302 (Linnestr. 5)
Submission Time: 11:00 a.m. at the submission day noted above

Please note: Write your name and matriculation number on EACH sheet of paper.
Only submit the calculations and results for exercise 1-3, exercise 4 will be discussed during the instruction classes.

Exercises:

1. Three concentric, thin long conducting cylindrical shells have radii of 2.00 mm, 5.00 mm, and 8.00 mm. The space between the shells is filled with air. The innermost and outermost shells are connected at one end by a conducting wire. Find the capacitance per unit length of this configuration. (8 Points)

2. A parallel-plate capacitor has a plate separation d and has a capacitance equal to C_0 where there is only empty space in the space between the plates. A slab of thickness t, where $t < d$, that has a dielectric constant κ is placed in the space between the plates completely covering one of the plates. What is the capacitance with the slab inserted? (6 Points)

3. Find an expression for the resistance between the ends of the half ring shown in Figure 1. The resistivity of the material constituting the half-ring is ρ. Hint: Model the half ring as a parallel combination of a large number of thin half-rings. Assume the current is uniformly distributed on a cross section of the half ring. (6 Points)

4. A capacitive pressure gauge is shown in Figure 2. Each plate has an area A. The plates are separated by a material that has a dielectric constant κ, a thickness d, and a Young's modulus Y. If a pressure increase of ΔP is applied to the plates, derive an expression for the change in capacitance.

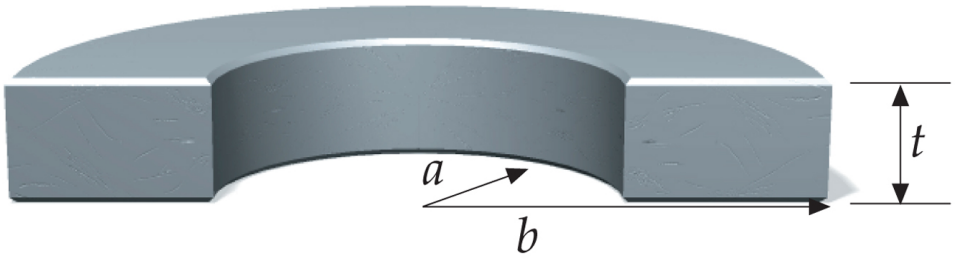

Figure 1: Exercise 3

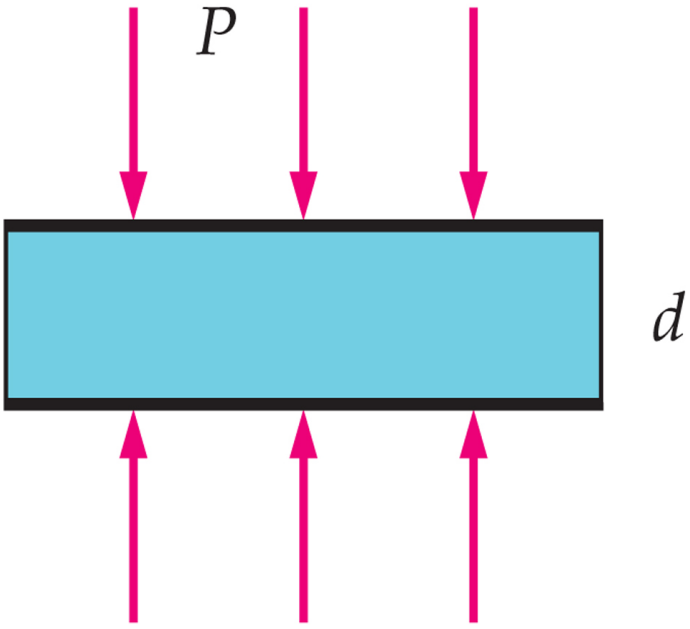

Figure 2: Exercise 4