

## Exercise 2

The key element of a Xerox machine is a charged drum which is coated with photoconductive material. A simplified sketch of this element is given in fig. 1. Calculate the electric field between the two electrodes.

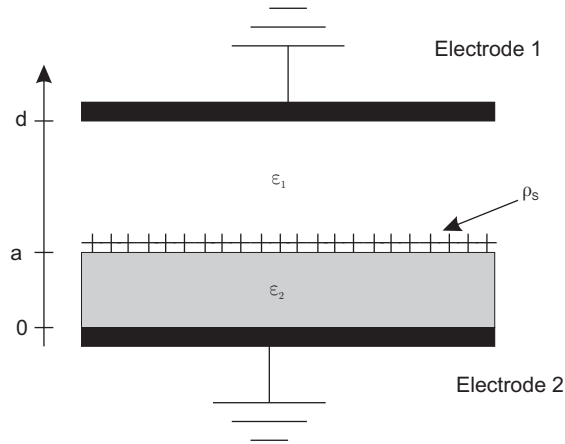


Figure 1: Simplified picture of a xerox machine drum coated with photoconductor. The photoconductor carries a positive charge  $\rho_s$ .

## Exercise 3

Determine a general potential function  $V$  for the region inside the rectangular trough of infinite length in  $z$ -direction whose cross section is shown in fig. 2. Furthermore calculate a specific potential  $V_m$  at  $x = \frac{a}{2}$ ,  $y = \frac{3a}{4}$  for  $V_0 = 100$  V and  $b = 2a$ .

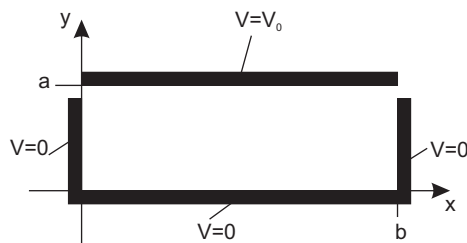


Figure 2: Boundary conditions of the electrical trough.

## Exercise 4

An electromagnetic wave described by its electric field as

$$\vec{E} = 4 \sin(2\pi 10^7 t - 0.8x) \vec{e}_z \quad (1)$$

is propagated in a linear, nonmagnetic, homogeneous and isotropic medium. Determine the relative permittivity  $\varepsilon_r$  and the wave impedance  $Z = \sqrt{\frac{\mu}{\varepsilon}}$  of the medium. Furthermore calculate the time averaged power density carried by the wave as well as the total power crossing an area of  $100 \text{ cm}^2$  in the plane  $2x + y = 5$ .