Electrics 3

1. A layer of porcelain is 80 mm long, 20 mm wide and 0.7 μm thick. Calculate its capacitance for $\varepsilon_r = 6$ ($\varepsilon_0 = 8.854 \cdot 10^{-12}$ F·m^{-1})

2. A parallel plate capacitor has a capacitance of 7.0 μF when filled with a dielectric. The area of each plate is 1.5 m^2 and the separation between the plates is $1.0 \cdot 10^{-5}$ m. What is the dielectric constant (relative permittivity) of the dielectric?

3. A parallel plate capacitor is partially filled with a dielectric material. The plates have an area of A = 0.05 m^2, the total separation is d = 2 mm, and the bottom half is filled with a dielectric ($\varepsilon_r = 3$), while the top half is filled with air ($\varepsilon_r = 1$).
   Calculate the total capacitance of the capacitor. Assume ($\varepsilon_0 = 8.854 \cdot 10^{-12}$ F·m^{-1})

4 Write down the equation for a sinusoidal voltage of 50 Hz and its peak value is 20 V. Draw the corresponding voltage versus time graph.

HW: Find the capacitance of Al$_2$O$_3$ layer that is 0.5 μm thick and it covers 2000 mm^2 of a square area ($\varepsilon_r = 1$, $\varepsilon_0 = 8.854 \cdot 10^{-12}$ F·m^{-1}).