2) L r=a , R=b

$\oint E \cdot dS = \frac{q}{\varepsilon_0}$ $C = \frac{q}{\Delta V}$

$\Delta V = \int_a^b E \cdot dr =$

$E 2\pi L R = \frac{q}{\varepsilon_0}$

$E = \frac{q}{2\pi\varepsilon_0 L R}$

$\Delta V = \frac{q}{2\pi\varepsilon_0 L} \int_a^b \frac{dR}{R}$

$\ln(b) - \ln(a) = \ln(\frac{b}{a})$

$C = \frac{q}{\frac{q}{2\pi\varepsilon_0 L} \cdot \ln(\frac{b}{a})} \Rightarrow C = \frac{2\pi\varepsilon_0 \cdot L}{\ln(\frac{b}{a})}$

b) serie:

$\frac{1}{C_{equ}} = \frac{1}{C_1} + \frac{1}{C_2}$

$C_2 = \frac{q}{\Delta V_2}$ $\Delta V_2 = \frac{q}{2\pi\varepsilon_0(L-h)} \cdot \ln(\frac{b}{a})$

$C_2 = \frac{q}{\frac{q}{2\pi\varepsilon_0(L-h)} \cdot \ln(b/a)}$

$C_2 = \frac{2\pi\varepsilon_0(L-h)}{\ln(b/a)}$

$C_1 = \frac{q}{\Delta V_1}$ $\Delta V_1 = \frac{q}{2\pi k\varepsilon_0 \cdot L} \cdot \ln(\frac{b}{a})$

$C_1 = \frac{q}{\frac{q}{2\pi k\varepsilon_0 L} \ln(\frac{b}{a})}$ $h = 3$

$C_1 = \frac{2\pi k\varepsilon_0 L}{\ln(\frac{b}{a})}$

$C_{equ} = \frac{C_1 C_2}{C_1 + C_2} \Rightarrow$

$C_{equ} = \frac{\left(\frac{2\pi k\varepsilon_0 h}{\ln(b/a)} \cdot \frac{2\pi\varepsilon_0(L-h)}{\ln(b/a)}\right)}{\left(\frac{2\pi k\varepsilon_0 h}{\ln(b/a)} + \frac{2\pi\varepsilon_0(L-h)}{\ln(b/a)}\right)}$

$C_{equ} = \frac{4\pi^2 k\varepsilon_0^2(hL-h^2)}{\frac{4\pi k\varepsilon_0 L}{\ln(b/a)}} = \frac{4\pi^2 k\varepsilon_0^2(hL-h^2)}{4\pi k\varepsilon_0 L}$

$\boxed{C_{equ} = \frac{2\pi\varepsilon_0(hL-h^2)}{L}}$?

c)

$q_{capacitor} = 1\,SPC$ $\Delta V = 12mV$?