restart;
 # em paralelo: soma-se

$$c[1] := \frac{\text{epsilon}[0]\cdot(A[1]-a[1])}{d[1]} + \frac{\text{epsilon}[0]\cdot a[1]\cdot\text{kappa}[1]}{d[1]};$$

$$\frac{\varepsilon_0\,(A_1-a_1)}{d_1} + \frac{\varepsilon_0\,a_1\,\kappa_1}{d_1} \tag{1}$$

 # em série: o inverso da soma dos inversos

$$c[2] := \frac{1}{\frac{1}{\frac{\text{epsilon}[0]\cdot A[2]}{(d[2]-a[2])}} + \frac{1}{\frac{\text{epsilon}[0]\cdot A[2]\cdot\text{kappa}[2]}{a[2]}}};$$

$$\frac{1}{\frac{d_2-a_2}{\varepsilon_0\,A_2} + \frac{a_2}{\varepsilon_0\,A_2\,\kappa_2}} \tag{2}$$

$$c[3] := \frac{\text{epsilon}[0]\cdot A[3]}{d[3]};$$

$$\frac{\varepsilon_0\,A_3}{d_3} \tag{3}$$

 # em paralelo

$$ceq[1] := c[2] + c[3];$$

$$\frac{1}{\frac{d_2-a_2}{\varepsilon_0\,A_2} + \frac{a_2}{\varepsilon_0\,A_2\,\kappa_2}} + \frac{\varepsilon_0\,A_3}{d_3} \tag{4}$$

 # em série, que é a capacitância equivalente do circuito com apenas um capacitor

$$ceq[2] := \frac{1}{\frac{1}{c[1]} + \frac{1}{ceq[1]}};$$

$$\frac{1}{\frac{1}{\frac{\varepsilon_0\,(A_1-a_1)}{d_1} + \frac{\varepsilon_0\,a_1\,\kappa_1}{d_1}} + \frac{1}{\frac{1}{\frac{d_2-a_2}{\varepsilon_0\,A_2} + \frac{a_2}{\varepsilon_0\,A_2\,\kappa_2}} + \frac{\varepsilon_0\,A_3}{d_3}}} \tag{5}$$

 # "simplificando"
simplify(*ceq*[2]);

$$-\left(\varepsilon_0\,(a_1\,\kappa_1 + A_1 - a_1)\,(A_2\,d_3\,\kappa_2 - A_3\,a_2\,\kappa_2 + A_3\,d_2\,\kappa_2 + A_3\,a_2)\right) \Big/ \left(a_1\,a_2\,d_3\,\kappa_1\,\kappa_2 - a_1\,d_2\,d_3\,\kappa_1\,\kappa_2 + A_1\,a_2\,d_3\,\kappa_2 - A_1\,d_2\,d_3\,\kappa_2 - A_2\,d_1\,d_3\,\kappa_2 + A_3\,a_2\,d_1\,\kappa_2 - A_3\,d_1\,d_2\,\kappa_2 - a_1\,a_2\,d_3\,\kappa_1 - a_1\,a_2\,d_3\,\kappa_2 + a_1\,d_2\,d_3\,\kappa_2 - A_1\,a_2\,d_3 - A_3\,a_2\,d_1 + a_1\,a_2\,d_3\right) \tag{6}$$

 # carga no capacitor equivalente 2, que é do circuito com apenas um capacitor

$qeq[2] := simplify(ceq[2] \cdot V[0]);$

$$-\left(\varepsilon_0 (a_1 \kappa_1 + A_1 - a_1)(A_2 d_3 \kappa_2 - A_3 a_2 \kappa_2 + A_3 d_2 \kappa_2 + A_3 a_2) V_0\right) \Big/ \left(a_1 a_2 d_3 \kappa_1 \kappa_2 - a_1 d_2 d_3 \kappa_1 \kappa_2 + A_1 a_2 d_3 \kappa_2 - A_1 d_2 d_3 \kappa_2 - A_2 d_1 d_3 \kappa_2 + A_3 a_2 d_1 \kappa_2 - A_3 d_1 d_2 \kappa_2 - a_1 a_2 d_3 \kappa_1 - a_1 a_2 d_3 \kappa_2 + a_1 d_2 d_3 \kappa_2 - A_1 a_2 d_3 - A_3 a_2 d_1 + a_1 a_2 d_3\right) \quad (7)$$

 # a carga em cada capacitor, c[1] e ceq[1], são iguais às cargas de ceq[2]. Assim, a tensão em c{1] é:

$q[1] := qeq[2]:$

$V[1] := simplify\left(\frac{q[1]}{c[1]}\right);$

$$-\left(d_1 V_0 (A_2 d_3 \kappa_2 - A_3 a_2 \kappa_2 + A_3 d_2 \kappa_2 + A_3 a_2)\right) \Big/ \left(a_1 a_2 d_3 \kappa_1 \kappa_2 - a_1 d_2 d_3 \kappa_1 \kappa_2 + A_1 a_2 d_3 \kappa_2 - A_1 d_2 d_3 \kappa_2 - A_2 d_1 d_3 \kappa_2 + A_3 a_2 d_1 \kappa_2 - A_3 d_1 d_2 \kappa_2 - a_1 a_2 d_3 \kappa_1 - a_1 a_2 d_3 \kappa_2 + a_1 d_2 d_3 \kappa_2 - A_1 a_2 d_3 - A_3 a_2 d_1 + a_1 a_2 d_3\right) \quad (8)$$

 # a tensão em c[2] e c[3] são as mesmas, e iguais a V[0]–V[1]

$V[2] := V[0] - V[1];$

$$V_0 + \left(d_1 V_0 (A_2 d_3 \kappa_2 - A_3 a_2 \kappa_2 + A_3 d_2 \kappa_2 + A_3 a_2)\right) \Big/ \left(a_1 a_2 d_3 \kappa_1 \kappa_2 - a_1 d_2 d_3 \kappa_1 \kappa_2 + A_1 a_2 d_3 \kappa_2 - A_1 d_2 d_3 \kappa_2 - A_2 d_1 d_3 \kappa_2 + A_3 a_2 d_1 \kappa_2 - A_3 d_1 d_2 \kappa_2 - a_1 a_2 d_3 \kappa_1 - a_1 a_2 d_3 \kappa_2 + a_1 d_2 d_3 \kappa_2 - A_1 a_2 d_3 - A_3 a_2 d_1 + a_1 a_2 d_3\right) \quad (9)$$

$q[2] := V[2] \cdot c[2];$

$$\frac{1}{\frac{d_2 - a_2}{\varepsilon_0 A_2} + \frac{a_2}{\varepsilon_0 A_2 \kappa_2}} \left(V_0 + \left(d_1 V_0 (A_2 d_3 \kappa_2 - A_3 a_2 \kappa_2 + A_3 d_2 \kappa_2 + A_3 a_2)\right) \Big/ \left(a_1 a_2 d_3 \kappa_1 \kappa_2 - a_1 d_2 d_3 \kappa_1 \kappa_2 + A_1 a_2 d_3 \kappa_2 - A_1 d_2 d_3 \kappa_2 - A_2 d_1 d_3 \kappa_2 + A_3 a_2 d_1 \kappa_2 - A_3 d_1 d_2 \kappa_2 - a_1 a_2 d_3 \kappa_1 - a_1 a_2 d_3 \kappa_2 + a_1 d_2 d_3 \kappa_2 - A_1 a_2 d_3 - A_3 a_2 d_1 + a_1 a_2 d_3\right)\right) \quad (10)$$

$q[3] := V[2] \cdot c[3];$

$$\frac{1}{d_3}\left(\left(V_0 + \left(d_1 V_0 (A_2 d_3 \kappa_2 - A_3 a_2 \kappa_2 + A_3 d_2 \kappa_2 + A_3 a_2)\right) \Big/ \left(a_1 a_2 d_3 \kappa_1 \kappa_2 - a_1 d_2 d_3 \kappa_1 \kappa_2 + A_1 a_2 d_3 \kappa_2 - A_1 d_2 d_3 \kappa_2 - A_2 d_1 d_3 \kappa_2 + A_3 a_2 d_1 \kappa_2 - A_3 d_1 d_2 \kappa_2 - a_1 a_2 d_3 \kappa_1 - a_1 a_2 d_3 \kappa_2 + a_1 d_2 d_3 \kappa_2 - A_1 a_2 d_3 - A_3 a_2 d_1 + a_1 a_2 d_3\right)\right) \varepsilon_0 A_3\right) \quad (11)$$

 # ratificação de que q[1]=q[2]+q[3]

$simplify(q[2] + q[3] - q[1]);$

$$0 \quad (12)$$

$A[1] := 10^{-4} : A[2] := A[1] : A[3] := A[1] :$

$d[1] := 4 \cdot 10^{-6} : d[2] := d[1] : d[3] := d[1] :$

$a[1] := 2 \cdot 10^{-5} : a[2] := 10^{-6} :$

$\text{kappa}[1] := 5 : \text{kappa}[2] := 10 :$

$\text{epsilon}[0] := 8.85 \cdot 10^{-12}:$

$V[0] := 120:$

 # carga q[1]

$evalf(q[1]);$

$$2.675938486\ 10^{-8} \tag{13}$$

 # carga $q[2]$

$evalf(q[2]);$

$$1.507570978\ 10^{-8} \tag{14}$$

 # carga q[3]

$evalf(q[3]);$

$$1.168367508\ 10^{-8} \tag{15}$$

 # tensão V[1]

$evalf(V[1]);$

$$67.19242902 \tag{16}$$

 # tensão V[2] e V[3]=V[2]

$evalf(V[2]);$

$$52.80757098 \tag{17}$$

 # energia c[1]

$U[1] := \frac{c[1] \cdot V[1]^2}{2};$

$$8.990140340\ 10^{-7} \tag{18}$$

 # energia c[2]

$U[2] := \frac{c[2] \cdot V[2]^2}{2};$

$$3.980558070\ 10^{-7} \tag{19}$$

 # energia c[3]

$U[3] := \frac{c[3] \cdot V[2]^2}{2};$

$$3.084932505\ 10^{-7} \tag{20}$$