

Villámvédelem házi feladat

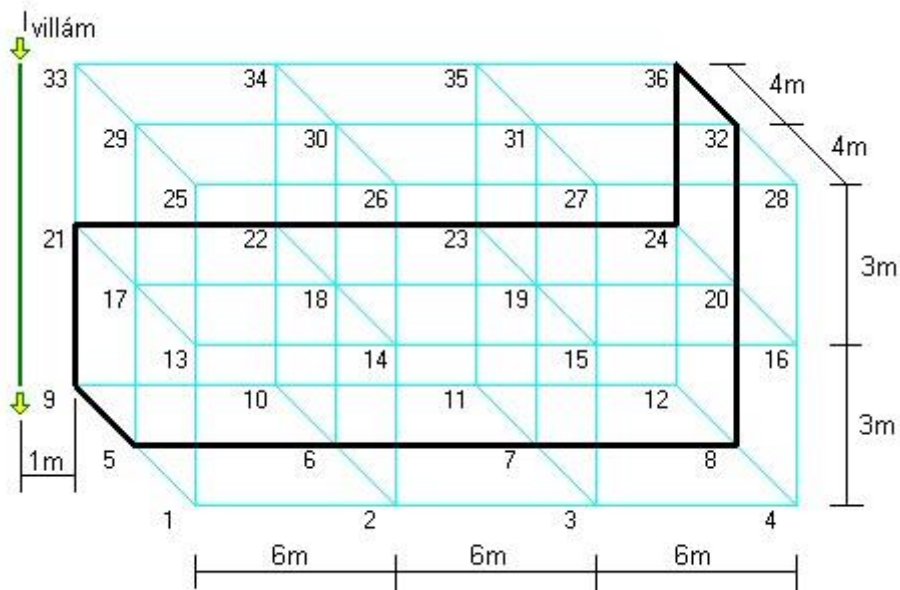
Név:

NEPTUN:

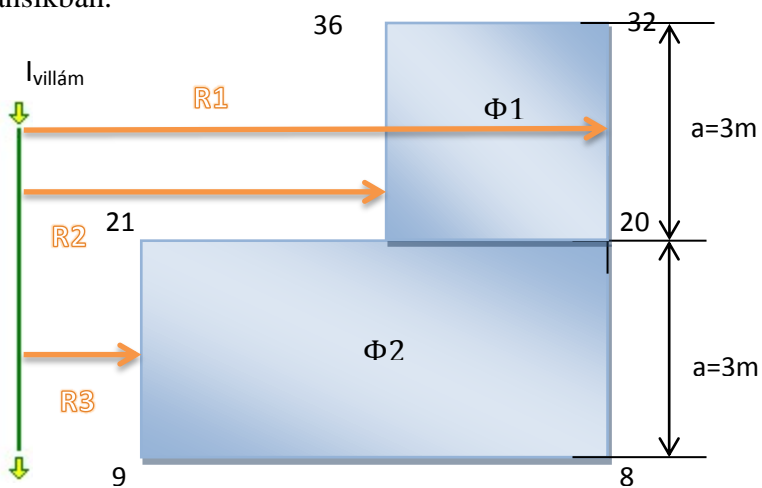
Feladat: loop37

Végeredmény: 53.78051175kV

Loop37:



Hurok a mediánsíkban:



$$R_1 = \sqrt{(1 + 6 + 6 + 6)^2 + (4)^2} = \sqrt{377} = 19,42m$$

$$R_2 = \sqrt{(1 + 6 + 6 + 6)^2} = 19m$$

$$R_3 = 1m$$

$$\frac{di}{dt} = 30 \frac{kA}{\mu s}$$

$$\mu_0 = 4 \cdot \pi \cdot 10^{-7} \frac{Vs}{Am}$$

Számítás:

Általánosságban:

$$\Phi = \frac{\mu_0}{4 \cdot \pi} \cdot 2 \cdot a \cdot i \cdot \int_{R_2}^{R_1} \frac{1}{x} dx = \frac{\mu_0}{4 \cdot \pi} \cdot 2 \cdot a \cdot i \cdot \ln \frac{R_1}{R_2}$$

Esetemben:

$$\Phi = \Phi_1 + \Phi_2 = \frac{\mu_0}{4 \cdot \pi} \cdot 2 \cdot a \cdot i \cdot \left(\int_{R_2}^{R_1} \frac{1}{x} dx + \int_{R_3}^{R_1} \frac{1}{x} dx \right) = \frac{\mu_0}{4 \cdot \pi} \cdot 2 \cdot a \cdot i \cdot \left(\ln \frac{R_1}{R_2} + \ln \frac{R_1}{R_3} \right)$$

$$u = \frac{d\Phi}{dt}$$

$$\Phi = \frac{4 \cdot \pi \cdot 10^{-7} Vs}{4 \cdot \pi Am} \cdot 2 \cdot 3m \cdot i \cdot \left(\ln \frac{\sqrt{377}m}{19m} + \ln \frac{\sqrt{377}m}{1m} \right)$$

$$u = 2 \cdot 3 \cdot 10^{-7} \cdot \left(\ln \frac{\sqrt{377}m}{19m} + \ln \frac{\sqrt{377}m}{1m} \right) \cdot \frac{di}{dt}$$

Végeredmény:

$$u = 2 \cdot 6 \cdot 10^{-7} \frac{Vs}{A} \cdot \left(\ln \frac{\sqrt{377}m}{19m} + \ln \frac{\sqrt{377}m}{1m} \right) \cdot 30 \frac{kA}{\mu s} = 53.78051175kV$$