Prijenos i razdjela električne energije
Auditorne vježbe 2

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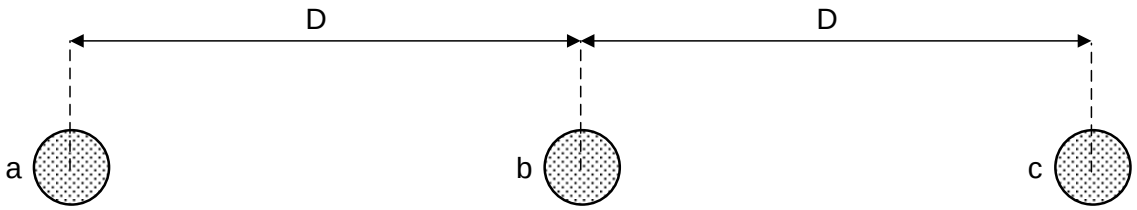
Zadatci

ZADATAK 1. Odredi pogonsku reaktanciju (f=50 Hz) jednostrukog trofaznog voda s horizontalnim rasporedom vodiča za slučaj:

a) neprepletenog voda

b) prepletenog voda

Radijus vodiča iznosi r = 13.3 mm, a međusobna udaljenost vodiča je D = 6.6 m.



RJEŠENJE:

a)

- Faza **a**:

$$L_a = 2 \cdot 10^{-4} \cdot \ln\left(\frac{D_{ma}}{D_{Sa}}\right) \quad [H/km]$$

$$D_{Sa} = r' = 0.7788 \cdot 13.3 = 10.36\ mm$$

$$D_{ma} = \sqrt{D \cdot 2D} = 6.6 \cdot \sqrt{2} = 9.33\ m$$

$$L_a = 1.36\ mH/km$$

- Faza **b**:

$$L_b = 2 \cdot 10^{-4} \cdot \ln\left(\frac{D_{mb}}{D_{Sb}}\right) \quad [H/km]$$

$$D_{Sb} = r' = 10.36\ mm$$

$$D_{mb} = \sqrt{D \cdot D} = 6.6\ m$$

$$L_b = 1.29\ mH/km$$

- Faza **c**:

$$L_c = L_a = 1.36\ mH/km$$

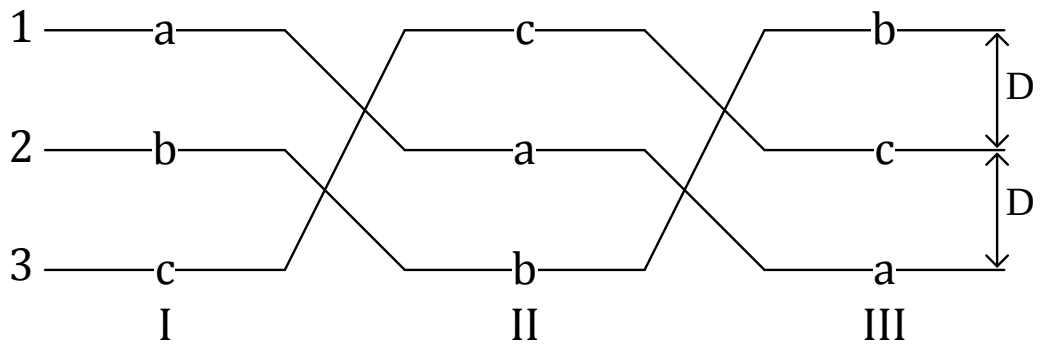
- Reaktancija pojedinih faza:

$$X_a = \omega \cdot L_a = 2\pi \cdot f \cdot L_a = 0.427\,\Omega / km$$

$$X_b = 0.405\,\Omega / km$$

$$X_c = X_a = 0.427\,\Omega / km$$

b)



$$L_a = L_b = L_c$$

$$L_a = \frac{L_{aI} + L_{aII} + L_{aIII}}{3}$$

$$L_{aI} = 2 \cdot 10^{-4} \cdot \ln \frac{D_{maI}}{D_{Sa}} \quad [H/km]$$

$$L_{aII} = 2 \cdot 10^{-4} \cdot \ln \frac{D_{maII}}{D_{Sa}} \quad [H/km]$$

$$L_{aIII} = 2 \cdot 10^{-4} \cdot \ln \frac{D_{maIII}}{D_{Sa}} \quad [H/km]$$

$$D_{Sa} = r' = 10.36\ mm$$

$$D_{maI} = \sqrt{D \cdot 2D} = 9.33\ m$$

$$D_{maII} = \sqrt{D \cdot D} = 6.6\ m$$

$$D_{maIII} = D_{maI} = 9.33\ m$$

$$L_{aI} = 1.36\ mH/km$$

$$L_{aII} = 1.29\ mH/km$$

$$L_{aIII} = 1.36\ mH/km$$

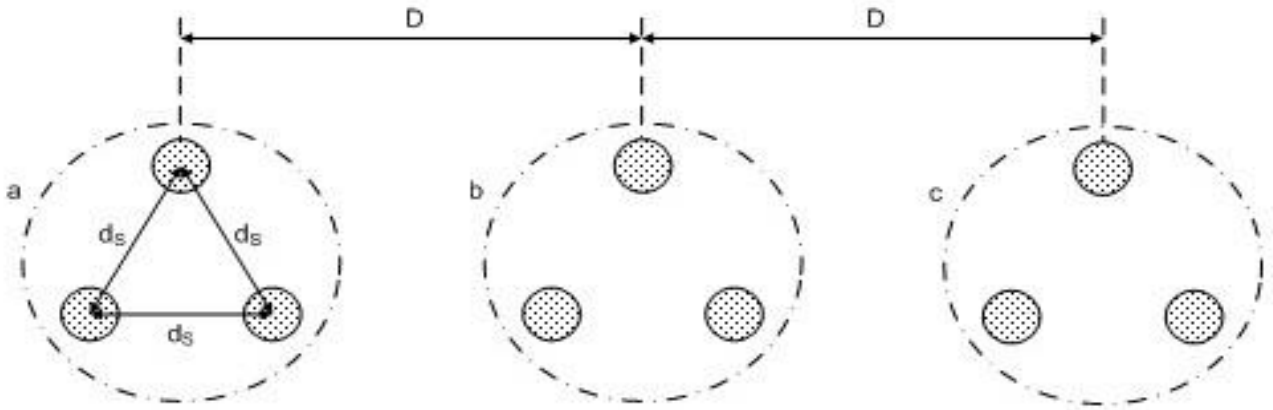
$L_{aI}, L_{aII}, L_{aIII}$ odgovaraju redom vrijednostima L_a, L_b, L_c iz **a)** dijela zadatka

$$L_a = L_b = L_c = L_1 = 1.34\ mH/km$$

$$X_1 = \omega \cdot L_1 = 0.42\ \Omega/km$$

Zadatci

ZADATAK 2. Metodom SGU odredite induktivitete po fazama za slučaj neprepletenog i prepletenog jednostrukog trofaznog voda. Faze se sastoje od tri vodiča u snopu prema slici.



Radijus vodiča iznosi 14 mm, udaljenost vodiča u snopu je 40 cm, a udaljenost između faza 15 m. Pretpostavite da su vodiči homogeni.

Prilikom računanja međusobnih SGU koristiti udaljenosti između ekvivalentiranih faznih vodiča.

RJEŠENJE:

a)

- Faza **a**:

$$L_a = 2 \cdot 10^{-4} \cdot \ln\left(\frac{D_{ma}}{D_{Sa}}\right) \quad [H/km]$$

$$D_{Sa} = \sqrt[3^2]{\left(r' \cdot d_S^2\right)^3} = \sqrt[3]{r' \cdot d_S^2}$$

$$D_{Sa} = D_{Sb} = D_{Sc} = 0.12\ m$$

$$D_{ma} = \sqrt{D \cdot 2D} = 21.213\ m$$

$$L_a = 1.035\ mH/km$$

- Faza **b**:

$$D_{mb} = \sqrt{D \cdot D} = 15\ m$$

$$L_b = 0.966\ mH/km$$

- Faza **c**:

$$L_c = L_a = 1.035\ mH/km$$

b)

$$L_a = L_b = L_c$$

$$L_a = \frac{L_{aI} + L_{aII} + L_{aIII}}{3}$$

$$D_{Sa} = 0.12\ m$$

$$D_{maI} = \sqrt{D \cdot 2D} = 21.213\ m$$

$$D_{maII} = \sqrt{D \cdot D} = 15\ m$$

$$D_{maIII} = D_{maI} = 21.213\ m$$

$$L_{aI} = 1.035\ mH/km$$

$$L_{aII} = 0.966\ mH/km$$

$$L_{aIII} = 1.035\ mH/km$$

$$L_a = L_b = L_c = L_1 = 1.012\ mH/km$$