Přípravné výpočty stability alternátoru

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Parametry zařízení

$$Un = 400$$

$$Unf = \frac{Un}{\sqrt{3}}$$

$$S_{ng} = 100$$

$$\cos(\varphi) = 0.8$$

$$P_{ng} = S_{ng} \cdot \cos(\varphi)$$

$$x_d = \frac{120}{100} \cdot \frac{Un^2}{Sng} \cdot i$$

$$x_d' = \frac{30}{100} \cdot \frac{Un^2}{Sng} \cdot i$$

```
% Napeti

i=sqrt(-1)

Un=400

Unf=Un/sqrt(3)


% Generator

Sng=100

CosFi=0.8

Png=Sng*CosFi

Xd= (120/100)*(Un^2/Sng)*i

Xdc=( 30/100)*(Un^2/Sng)*i
```

Parametry zařízení

$$S_{nt1} = 100$$

$$u_{kt1} = 10$$

$$X_{t1} = \frac{U_{kt1}}{100} \cdot \frac{U_n^2}{S_{nt1}} \cdot i$$

```
% Transformator T1
Snt1=100
Ukt1=10
Xt1=(Ukt1/100)*(Un^2/Snt1)*i
```

$$delka = 50$$

$$X_{v1} = delka \cdot 0.3 \cdot i \frac{U_n^2}{110^2}$$

```
% Vedeni
delka=50
Xv1=delka*0.3*i/110^2*Un^2
```

$$Xv = \frac{Xv1}{2}$$

```
Xv=Xv1/2
```

Parametry zařízení

$$S_{nt2} = 100$$
$$u_{kt2} = 10$$
$$X_{t2} = \frac{U_{kt2}}{100} \cdot \frac{U_n^2}{S_{nt2}} \cdot i$$

```
% Transformator T2
Snt2=100
Ukt2=10
Xt2=(Ukt2/100)*(Un^2/Snt2)*i
```

$$S_k = 10000$$
$$C = 1$$
$$X_s = C \cdot \frac{U_n^2}{S_k} \cdot i$$

```
% Sit
Sk=10000
KoefC=1
Xs=KoefC*(Un^2/Sk)*i
```

Předporuchový stav

$$P_{ng0} = 1.00 \cdot P_{ng}$$
$$P_t = P_{ng0}$$
$$\vartheta = \frac{75}{180}\pi$$
$$\vartheta' = \vartheta$$

$$X_{suma} = |X_d + X_{t1} + X_v + X_{t2} + X_s|$$
$$X_{suma}{}' = |X_d{}' + X_{t1} + X_v + X_{t2} + X_s|$$

```
% Vypocet predporuchoveho stavu, pocatecni zatizeni 100%

% Zvolit zatezny uhel

Png0=1.00*Png

Pt=Png0

Theta=75/180*pi

Thetac=Theta


% Celkova vazebni reaktance

Xsuma =abs(Xd +Xt1+Xv+Xt2+Xs)

Xsumac=abs(Xdc+Xt1+Xv+Xt2+Xs)
```

Předporuchový stav

$$E = \frac{P_{ng0}}{3 \cdot U_{nf} \cdot \sin(\vartheta)} X_{suma}$$

```
% Vypocet potrebneho nabuzeni E a E'
E= Png0/3/Unf*Xsuma/sin(Theta)
```

$$E' = \frac{P_{ng0}}{3 \cdot U_{nf} \cdot \sin(\vartheta)} X_{suma}{}'$$

```
Ec=Png0/3/Unf*Xsumac/sin(Theta)
```

$$P_{gkontrola} = 3 \frac{E \cdot Unf}{X_{suma}} \sin(\vartheta)$$

```
Pgkontrola=3*E*Unf/Xsuma*sin(Theta)
```

$$P_{gkontrola}{}' = 3 \frac{E' \cdot Unf}{X_{suma}{}'} \sin(\vartheta)$$

```
Pgckontrola=3*Ec*Unf/Xsumac*sin(Thetac)
```

Zkrat v polovině vedení

$$X_a = \frac{X_{v1}\frac{X_{v1}}{2}}{X_{v1} + \frac{X_{v1}}{2} + \frac{X_{v1}}{2}}$$

$$X_b = \frac{X_{v1}\frac{X_{v1}}{2}}{X_{v1} + \frac{X_{v1}}{2} + \frac{X_{v1}}{2}}$$

$$X_c = \frac{\frac{X_{v1}}{2} \cdot \frac{X_{v1}}{2}}{X_{v1} + \frac{X_{v1}}{2} + \frac{X_{v1}}{2}}$$

```
% Zkrat v polovine vedeni Xv1

% Nahrada trojuhelnika hvezdou
Xa=Xv1*Xv1/2/(Xv1+Xv1/2+Xv1/2)
Xb=Xv1*Xv1/2/(Xv1+Xv1/2+Xv1/2)
Xc=Xv1/2*Xv1/2/(Xv1+Xv1/2+Xv1/2)
```

$$X_l = X_d{}' + X_{t1} + X_a$$

$$X_r = X_b + X_{t2} + X_s$$

$$X_{sumazkrat} = X_l + X_r + \frac{X_l \cdot X_r}{X_c}$$

```
Xl=Xdc+Xt1+Xa
Xr=Xb+Xt2+Xs
Xsumazkrat=abs(Xl + Xr + Xl*Xr/Xc)
```

Odpojení poruchy

$$X_{sumaodpojeno} = |i \cdot X_{suma} - X_v + X_{v1}|$$

$$X_{sumaodpojeno2} = |X_{dc} + X_{t1} + X_{v1} + X_{t2} + X_s|$$

$$P_{max1} = 3\frac{Ec \cdot Unf}{X_{suma}'}$$

$$P_{max2} = 3\frac{Ec \cdot Unf}{X_{sumazkrat}}$$

$$P_{max3} = 3\frac{Ec \cdot Unf}{X_{sumaodpojeno}}$$

$$Y_{12} = \frac{1}{X_{suma}'}$$

$$Y_{12zkrat} = \frac{1}{X_{sumazkrat}}$$

$$Y_{12odpojeno} = \frac{1}{X_{sumaodpojeno}}$$

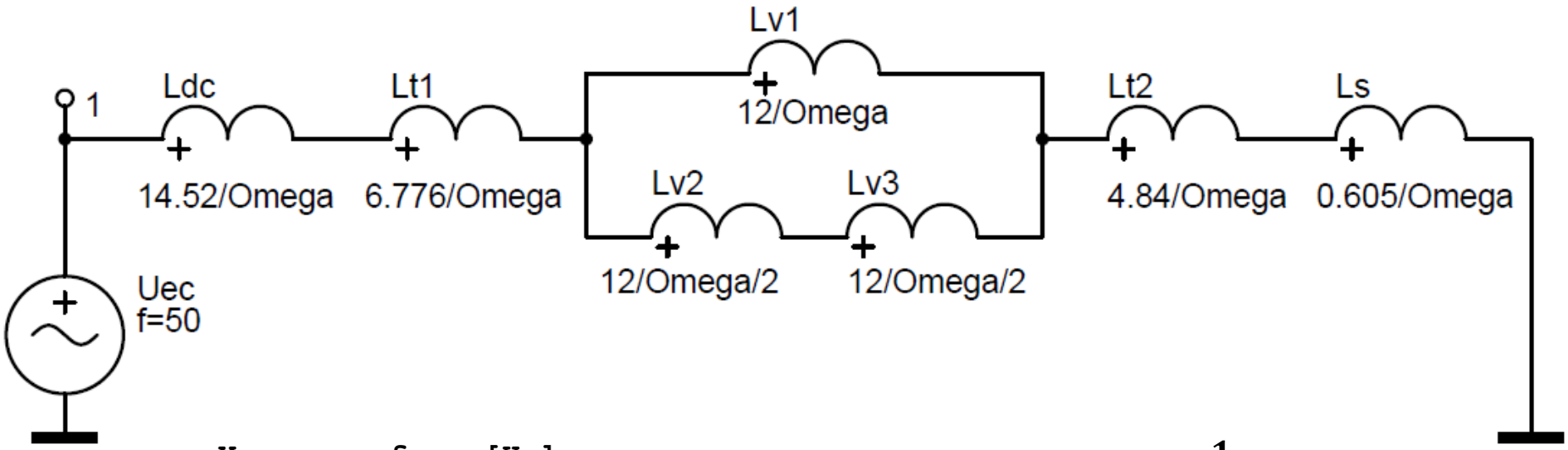
```
% Odpojeni poruchy

Xsumaodpojeno=
        abs(i*Xsumac -Xv + Xv1)

Xsumaodpojeno2=
        abs(Xdc + Xt1 + Xv1 + Xt2 + Xs)
```

```
% Konecne alternativy maximalnich
dodavanych cinnych vykonu

Pmax1=3*Ec*Unf/Xsumac

Pmax2=3*Ec*Unf/Xsumazkrat

Pmax3=3*Ec*Unf/Xsumaodpojeno
```

```
% Kontrolni admitance

Y12=          1/Xsumac

Y12zkrat=     1/Xsumazkrat

Y12odpojeno=1/Xsumaodpojeno
```

Předporuchový stav

$$X_{suma} = |X_d + X_{t1} + X_v + X_{t2} + X_s|$$
$$X_{suma}' = |X_d' + X_{t1} + X_v + X_{t2} + X_s|$$

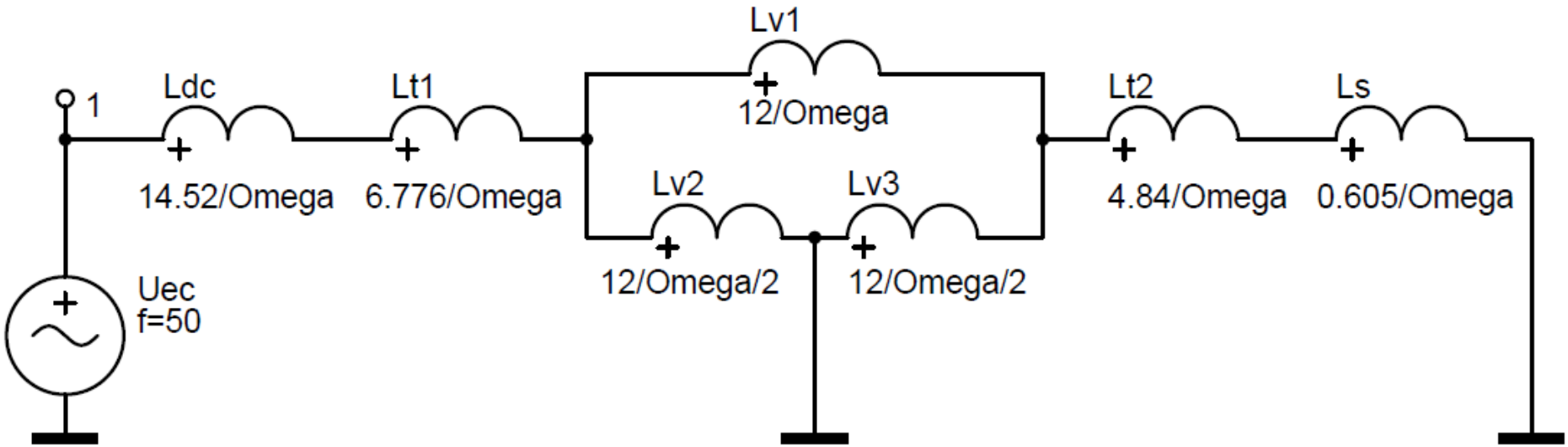



```
X ...    freq [Hz]
1 ...    MOD.I.Ldc
2 ...    DEG.I.Ldc
3 ...    MOD.I.Ls
4 ...    DEG.I.Ls

     X                1                2                3                4
5.000000e+001  3.054274e-002  2.700000e+002  3.054274e-002  2.700000e+002
```

$$Y_{12} = \frac{1}{X_{suma}'}$$

Zkrat v polovině vedení

$$X_{sumazkrat} = X_l + X_r + \frac{X_l \cdot X_r}{X_c}$$

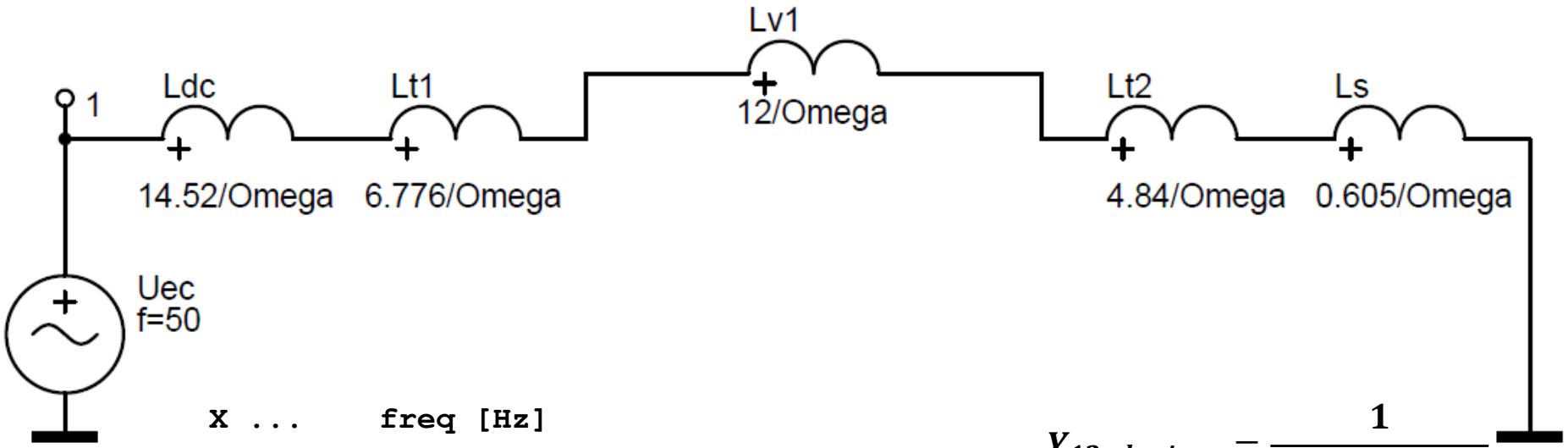



```
X ...    freq [Hz]
 1 ...    MOD.I.Ldc
 2 ...    DEG.I.Ldc
 3 ...    MOD.I.Ls
 4 ...    DEG.I.Ls

     X              1              2              3              4
5.000000e+001  3.910870e-002  2.700000e+002  5.898749e-003  2.700000e+002
```

$$Y_{12zkrat} = \frac{1}{X_{sumazkrat}}$$

Odpojení poruchy

$$X_{sumaodpojeno} = |X_{dc} + X_{t1} + X_{v1} + X_{t2} + X_s|$$




```
X ...    freq [Hz]
1 ...    MOD.I.Ldc
2 ...    DEG.I.Ldc
3 ...    MOD.I.Ls
4 ...    DEG.I.Ls

     X                1                2                3                4
5.000000e+001  2.581245e-002  2.700000e+002  2.581245e-002  2.700000e+002
```

$$Y_{12odpojeno} = \frac{1}{X_{sumaodpojeno}}$$