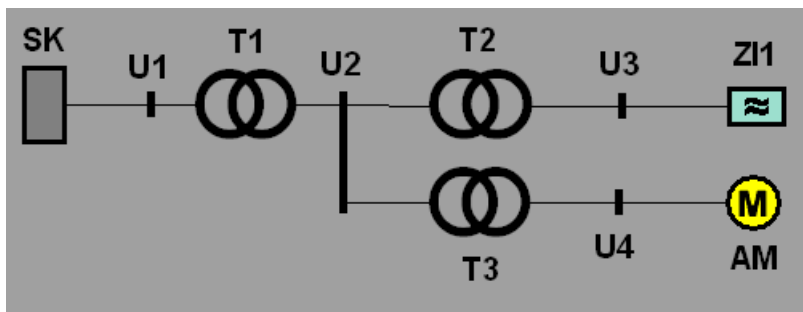


```
In[1]:= Off[General::"spell1"];
<< Graphics`Graphics`;
```



## ■ zadané parametry

```
In[3]:= Trafo1 = {uk -> 0.04, U1 -> 110 000, U2 -> 22 000, Sn -> 80 * 10^6, Pk -> 12 * 10^3};
Trafo2 = {uk -> 0.04, U1 -> 22 000, U2 -> 400, Sn -> 160 * 10^3, Pk -> 10.35 * 10^3};
Trafo3 = {uk -> 0.04, U1 -> 22 000, U2 -> 400, Sn -> 100 * 10^3, Pk -> 2.35 * 10^3};
Soustava = {S -> 1500 * 10^3, U -> 110 000};
Motor = {Pn -> 16 000, cosfi -> 0.8, iz -> 8, U -> 400};

In[8]:= w0 = 100 * Pi;
```

## ■ vypočtené parametry

```
In[9]:= LT1 = uk * U2^2 / (w0 * Sn) /. Trafo1
pzT1 = (U2 / U1)^2 /. Trafo1 // N
rkT1 = Pk * U2^2 / Sn^2 /. Trafo1 // N
```

Out[9]= 0.00077031

Out[10]= 0.04

Out[11]= 0.0009075

```
In[12]:= LT2 = uk * U2^2 / (w0 * Sn) /. Trafo2
pzT2 = (U2 / U1)^2 /. Trafo2 // N
rkT2 = Pk * U2^2 / Sn^2 /. Trafo2 // N
```

Out[12]= 0.000127324

Out[13]= 0.000330579

Out[14]= 0.0646875

```
In[15]:= LT3 = uk * U2^2 / (w0 * Sn) /. Trafo3
pzT3 = (U2 / U1)^2 /. Trafo3 // N
rkT3 = Pk * U2^2 / Sn^2 /. Trafo3 // N
```

Out[15]= 0.000203718

Out[16]= 0.000330579

Out[17]= 0.0376

```
In[18]:= Ls = U2 / (ω0 * S) /. Soustava // N
```

```
Out[18]= 25.677
```

```
In[19]:= Lm = U2 * cosfi / (ω0 * iz * Pn) /. Motor // N
```

```
Out[19]= 0.0031831
```

## ■ admitanční matice (S)

```
In[20]:= Y1 = { - (  $\frac{1}{i \omega * Ls * pzT1 * pzT3} + \frac{1}{(rkT1 + i \omega * LT1) * pzT3}$  ),  

 $\frac{1}{(rkT1 + i \omega * LT1) * pzT3}$ , 0, 0 } // N;
```

```
In[21]:= Y2 = {  $\frac{1}{(rkT1 + i \omega * LT1) * pzT3}$ ,  

- (  $\frac{1}{(rkT1 + i \omega * LT1) * pzT3} + \frac{1}{(rkT2 + i \omega * LT2)}$  +  $\frac{1}{(rkT3 + i \omega * LT3)}$  ),  

 $\frac{1}{(rkT2 + i \omega * LT2)}$ ,  $\frac{1}{(rkT3 + i \omega * LT3)}$  };
```

```
In[22]:= Y3 = { 0,  $\frac{1}{(rkT2 + i \omega * LT2)}$ , - (  $\frac{1}{(rkT2 + i \omega * LT2) * pzT3}$  ), 0 };
```

```
In[23]:= Y4 = { 0,  $\frac{1}{(rkT3 + i \omega * LT3)}$ , 0, - (  $\frac{1}{(rkT3 + i \omega * LT3)} + \frac{1}{i \omega * Lm}$  ) };
```

```
In[24]:= Y = {Y1, Y2, Y3, Y4};  
Transpose[Y] == Y  
MatrixForm[Y] /. {k → 1, ω → ω0};
```

```
Out[25]= True
```

```
In[27]:= MatrixForm[-Inverse[Y]] /. {k → 1, ω → ω0}
```

```
Out[27]//MatrixForm=
```

$$\begin{pmatrix} 0.0265157 + 0.0408013 i & 0.0265354 + 0.0407518 i & 8.77205 \times 10^{-6} + 0.00001 \\ 0.0265354 + 0.0407518 i & 0.0265555 + 0.0407823 i & 8.77866 \times 10^{-6} + 0.00001 \\ 8.77205 \times 10^{-6} + 0.0000134717 i & 8.77866 \times 10^{-6} + 0.0000134818 i & 0.0000213872 + 0.00001 \\ 0.0235564 + 0.039133 i & 0.0235742 + 0.0391623 i & 7.79313 \times 10^{-6} + 0.00001 \end{pmatrix}$$

```
In[28]:= Ilusmer = 400 000 / (400 * Sqrt[3]) // N
```

```
Out[28]= 577.35
```

## ■ 250Hz

```
In[29]:= Y250z12 := Y /. {k → 1, ω → 5 * 100 * Pi}
```

```
In[30]:= Y250z12
```

```
Out[30]= {{-1.875 + 2501.87 i, 1.875 - 2500. i, 0., 0.},  

{1.875 - 2500. i, -3.70122 + 2507.61 i, 1.46403 - 4.52648 i, 0.362187 - 3.08244 i},  

{0, 1.46403 - 4.52648 i, -4428.7 + 13 692.6 i, 0},  

{0, 0.362187 - 3.08244 i, 0, -0.362187 + 3.28244 i}}
```

```
In[31]:= Z250z12 := Inverse[Y250z12] (*Ω*)
```

```
In[32]:= Z250z12
```

```
Out[32]= {{-0.032127 - 0.144852 i, -0.0321509 - 0.144561 i, -0.0000106284 - 0.0000477886 i,
          -0.0292553 - 0.136072 i}, {-0.0321509 - 0.144561 i, -0.0321751 - 0.144669 i,
          -0.0000106364 - 0.0000478245 i, -0.0292773 - 0.136174 i},
          {-0.0000106284 - 0.0000477886 i, -0.0000106364 - 0.0000478245 i,
          -0.0000213878 - 0.0000661315 i, -9.67845 × 10-6 - 0.0000450162 i},
          {-0.0292553 - 0.136072 i, -0.0292773 - 0.136174 i,
          -9.67845 × 10-6 - 0.0000450162 i, -0.0598215 - 0.429158 i}}
```

```
In[33]:= I5 =  $\frac{I_{lusmer}}{5}$  (*A*)
```

```
Out[33]= 115.47
```

```
In[34]:= U250z12 = Abs[Z250z12.{0, 0, I5, 0}] * Sqrt[3] // N // Flatten(*V*)
```

```
Out[34]= {0.00979125, 0.00979859, 0.0139008, 0.00920898}
```

```
In[35]:= umer = {110 / 0.4, 22 / 0.4, 1, 1}
```

```
Out[35]= {275., 55., 1, 1}
```

```
In[36]:= U250prepocet = Abs[umer * U250z12] (*V*)
```

```
Out[36]= {2.69259, 0.538923, 0.0139008, 0.00920898}
```

```
In[37]:= U250relative = U250z12 / 4 (***)
```

```
Out[37]= {0.00244781, 0.00244965, 0.0034752, 0.00230224}
```

### ■ 350Hz

```
In[38]:= Y350z12 := Y /. {k → 1, ω → 7 * 100 * Pi}
```

```
In[39]:= Z350z12 := Inverse[Y350z12] (*Ω*)
```

```
In[40]:= I7 =  $\frac{I_{lusmer}}{7}$  (*A*)
```

```
Out[40]= 82.4786
```

```
In[41]:= U350z12 = Abs[Z350z12.{0, 0, I7, 0}] * Sqrt[3] // N // Flatten(*V*)
```

```
Out[41]= {0.00958243, 0.00958962, 0.0135746, 0.00901268}
```

```
In[42]:= U350prepocet = Abs[umer * U350z12] (*V*)
```

```
Out[42]= {2.63517, 0.527429, 0.0135746, 0.00901268}
```

```
In[43]:= U350relative = U350z12 / 4 (***)
```

```
Out[43]= {0.00239561, 0.0023974, 0.00339365, 0.00225317}
```

### ■ 550Hz

```
In[44]:= Y550z12 := Y /. {k → 1, ω → 11 * 100 * Pi}
```

```
In[45]:= Z550z12 := Inverse[Y550z12] (*Ω*)
Z550z12
```

```
Out[46]= {{-0.0323539 - 0.313413 i, -0.0323779 - 0.312768 i, -0.0000107034 - 0.000103395 i,
-0.0294857 - 0.29405 i}, {-0.0323779 - 0.312768 i, -0.0324023 - 0.313003 i,
-0.0000107115 - 0.000103472 i, -0.0295079 - 0.294271 i},
{-0.0000107034 - 0.000103395 i, -0.0000107115 - 0.000103472 i,
-0.0000213878 - 0.000145489 i, -9.75468 × 10-6 - 0.0000972795 i},
{-0.0294857 - 0.29405 i, -0.0295079 - 0.294271 i,
-9.75468 × 10-6 - 0.0000972795 i, -0.0600566 - 0.938417 i}}
```

```
In[47]:= I11 =  $\frac{\text{I1usmer}}{11}$  (*A*)
```

```
Out[47]= 52.4864
```

```
In[48]:= U550z12 = Abs[Z550z12.{0, 0, I11, 0}] * Sqrt[3] // N // Flatten(*V*)
```

```
Out[48]= {0.00944973, 0.00945682, 0.0133684, 0.00888794}
```

```
In[49]:= U550prepocet = Abs[umera * U550z12] (*V*)
```

```
Out[49]= {2.59868, 0.520125, 0.0133684, 0.00888794}
```

```
In[50]:= U550relative = U550z12 / 4 (*%*)
```

```
Out[50]= {0.00236243, 0.00236421, 0.0033421, 0.00222199}
```

#### ■ 650Hz

```
In[51]:= Y650z12 := Y /. {k → 1, ω → 13 * 100 * Pi}
```

```
In[52]:= Z650z12 := Inverse[Y650z12] (*Ω*)
```

```
In[53]:= I13 =  $\frac{\text{I1usmer}}{13}$  (*A*)
```

```
Out[53]= 44.4116
```

```
In[54]:= U650z12 = Abs[Z650z12.{0, 0, I13, 0}] * Sqrt[3] // N // Flatten(*V*)
```

```
Out[54]= {0.00942378, 0.00943085, 0.0133282, 0.00886355}
```

```
In[55]:= U650prepocet = Abs[umera * U650z12] (*V*)
```

```
Out[55]= {2.59154, 0.518697, 0.0133282, 0.00886355}
```

```
In[56]:= U650relative = U650z12 / 4 (*%*)
```

```
Out[56]= {0.00235595, 0.00235771, 0.00333204, 0.00221589}
```

```

In[57]:= BarChart[U250relative, U350relative, U550relative,
  U650relative, BarSpacing → 0, BarGroupSpacing → 0.2,
  ImageSize → 600, BarLabels → {"1-110", "2-22", "3-0.4", "4-0.4"},
  AxesLabel → {"uzel-napeti", "u(%)", TextStyle → {"FontSize" → 12}},
  PlotLabel → StyleForm["Harmonicka napeti 5,7,11,13",
    "Subsection", FontSize → 18, FontColor → Blue]]

```

## Harmonicka napeti 5,7,11,13

