

**12.1.**

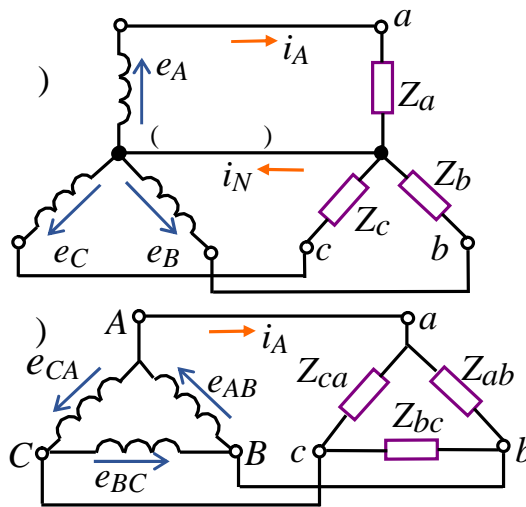
**12.1.1.**

120°:

$$e_A = E_m \sin \omega t, \underline{E}_A = E_m / \sqrt{2} e^{j0^\circ} = E ;$$

$$e_B = E_m \sin(\omega t - 120^\circ), \underline{E}_B = E_m / \sqrt{2} e^{-j120^\circ} ;$$

$$e_C = E_m \sin(\omega t - 240^\circ) = E_m \sin(\omega t + 120^\circ), \underline{E}_C = E_m / \sqrt{2} e^{j120^\circ} .$$



12.1 –

» ( ), « » ( ) , « » ( . 12.1 , ( ) ) , « » ( . 12.1 , , ) . « » , « » ( . 12.1 , , ) .

**12.1.2.**

. 12.2, , « » ( ) ( -

).

$$\underline{U}_a' = \underline{U}_A ; \underline{U}_b' = \underline{U}_B \quad \underline{U}_c' = \underline{U}_C ,$$

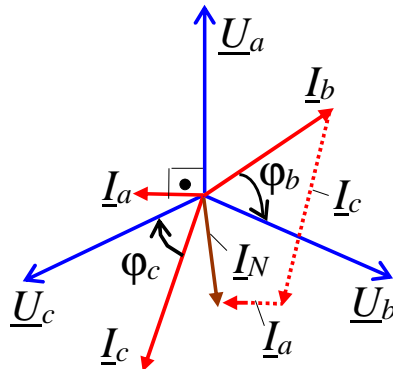
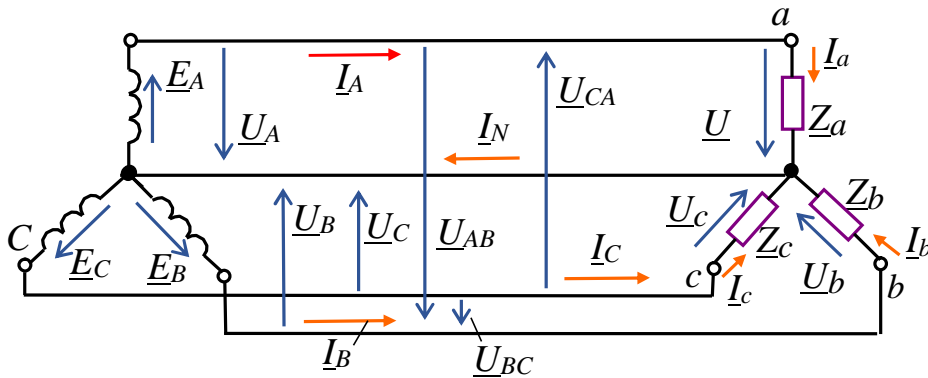
$$(\underline{U}_{o'o} = 0).$$

$$: U = U / \sqrt{3},$$

$$\sqrt{3}$$

$$U = 380 ,$$

$$U = U / \sqrt{3} = 220 \text{ B} ( U = 220 , U = U / \sqrt{3} = 127 \text{ B}).$$



12.2 –

( ) ( ),

( )

( )

( $\underline{Z}_a \neq \underline{Z}_b \neq \underline{Z}_c$ ,

$$, \underline{Z}_a = -jX_a, \underline{Z}_b = R_b - jX_b \quad \underline{Z}_c = R_c - jX_c),$$

$$I = U / Z = I ,$$

$$I_N = I_a + I_b + I_c .$$

$$( )$$

$$(Z_a = Z_b = Z_c = Z) \\ I =$$

$$I = U / Z .$$

$$( ) ,$$

$$I_N = I_a + I_b + I_c = 0 ,$$

:

« - » (Y-Y).

$$Y$$

$$( )$$

Y-

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. 12.2, ) ,

$$U_{O'O} = \frac{E_A Y_a + E_B Y_b + E_C Y_c}{Y_a + Y_b + Y_c} ,$$

$$Y_a = 1/Z_a ; Y_b = 1/Z_b ; Y_c = 1/Z_c -$$

$$U_a = U_A - U ; U_b = U_B - U ; U_c = U_C - U .$$

(« » ) ,

$$U_a$$

$$( ) ,$$

$$U_A$$

$$Z_a = R , Z_b = jX_L , Z_c = -jX_C .$$

$$I = U / Z ; I_b = U_b / Z_b ; I_c = U_c / Z_c ,$$

$$I_a + I_b + I_c = 0 .$$

### 12.1.3. ,

. 12.3,

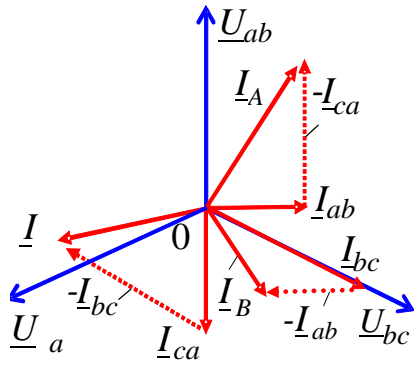
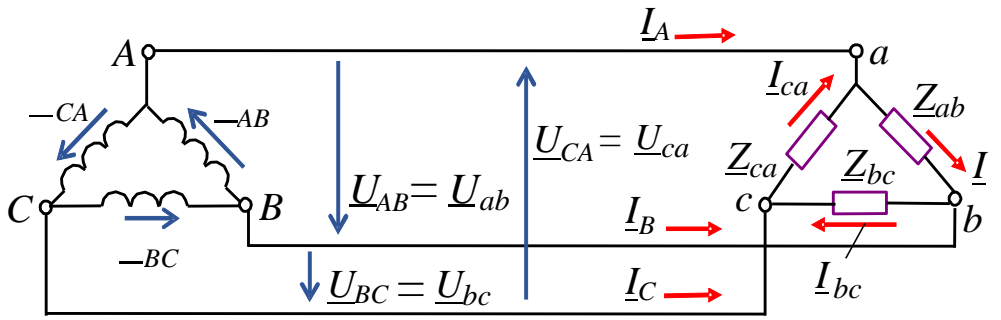
« - » .

$$( ) ,$$

$$U = U ,$$

:

$$\underline{I}_{ab} = \underline{U}_{ab} / \underline{Z}_{ab}; \underline{I}_{bc} = \underline{U}_{bc} / \underline{Z}_{bc}; \underline{I}_{ca} = \underline{U}_{ca} / \underline{Z}_{ca}$$



12.3- ,  
 « - » ( ), ( )

$$\underline{I}_A = \underline{I}_{ab} - \underline{I}_{ca}; \underline{I}_B = \underline{I}_{bc} - \underline{I}_{ab}; \underline{I}_C = \underline{I}_{ca} - \underline{I}_{bc}$$

$$\underline{I}_A + \underline{I}_B + \underline{I}_C = 0.$$

$$(\underline{Z}_{ab} = jX_{ab}, \underline{Z}_{bc} = R_{bc}, \underline{Z}_{ca} = R_{ca} - jX_{ca})$$

. 12.3, .

$$(\underline{Z}_{ab} = \underline{Z}_{bc} = \underline{Z}_{ca} = \underline{Z})$$

$$\underline{I}_{ab} = \underline{I}_{bc} = \underline{I}_{ca} = \underline{I} = \underline{U} / \underline{Z} .$$

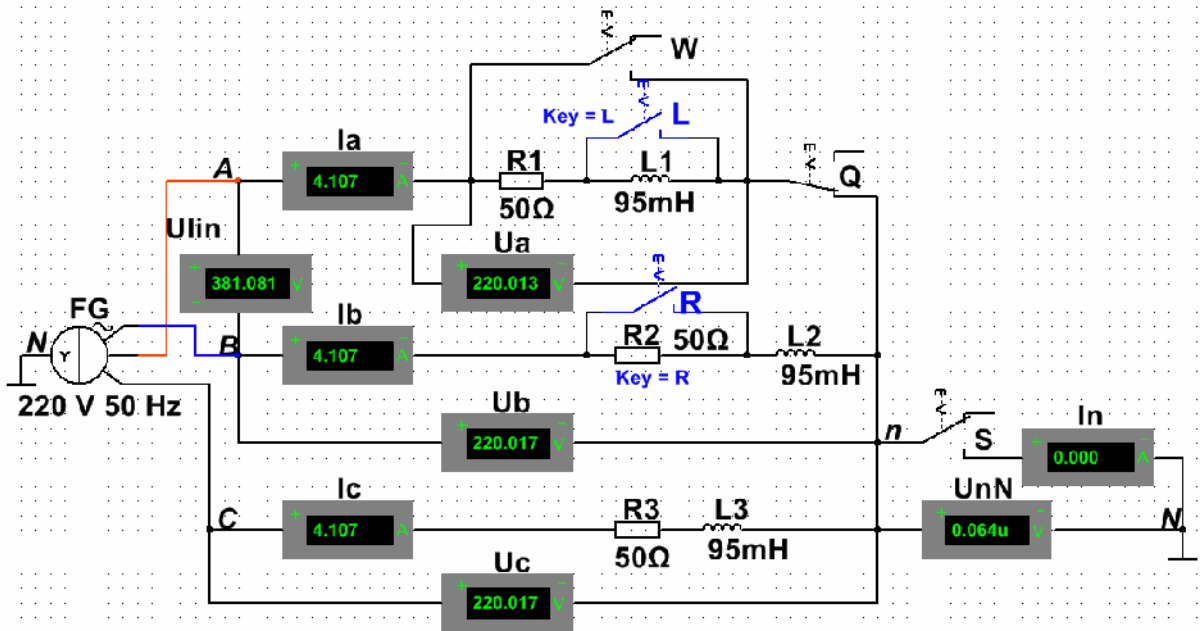
$$\underline{I}_{ab} + \underline{I}_{bc} + \underline{I}_{ca} = 0 \quad \underline{I}_A + \underline{I}_B + \underline{I}_C = 0,$$

$$I = I / \sqrt{3} \quad I = \sqrt{3} I .$$

12.2.

12.2.1. Multisim

« - » ( . 12.4).



12.4 – Multisim

« - »

( . 12.4):

- $U = 220$   $f = 50$
- FG ( POWER\_SOURCES\THREE\_PHASE\_WYE);
- $R_V = 10\text{ M}$  :
- Ulin ( );
- Ua, Ub s U ( );
- U ( );
- $R = 1$  :
- Ia, Ib I ( );
- In ( );
- Q, W S ;
- :
- $\underline{Z}_a = \underline{Z}_b = \underline{Z}_c = R + jX_L = [(20 + N) + j(15 + N)]$ ,  $N -$

Multisim ( . 12.1) . 12.1

( )

$$\varphi = \arctg(X / R).$$

$I_N$

12.2.2.

12.1

		$U_B$	$U_a$	$U_b$	$U_c$	$U_{nN}$	$I_a$	$I_b$	$I_c$	$I_N$
-	(S, Q, W, R, L): $Z = R + jX$									
-	(S, R, L, Q, W): $Z_a = R; Z_b = +jX; Z_c = R + jX$									
-	(Q, S, R, L, W): $Z = R + jX$									-
-	(Q, R, L, S, W): $Z_a = R; Z_b = +jX; Z_c = R + jX$									-
-	(S, Q, W, R): $(Z_a = \infty)$ ; $Z_b = +jX; Z_c = R + jX$									-
-	(W, R, Q, S): $Z_a = 0$ ; $Z_b = +jX; Z_c = R + jX$									-

$Z = R = 20$  ( ),  
 $Z = R = 0,1$  ( ),  
 $I$  ,  $W$

$U$ ,

$$: I_a + I_b + I_c = 0.$$

(  $U$  , )

$U$  ,  $U_b$  ,

$\underline{U}$  ).

(  $\underline{U}$  ,  $\underline{U}_b$  ,  $\underline{U}$  ,

### 12.2.3. Multisim

« - » ( . 12.5).

. 12.2.1.

. 12.2

C.

. 12.2.

$$\varphi = \arctg(X / R).$$

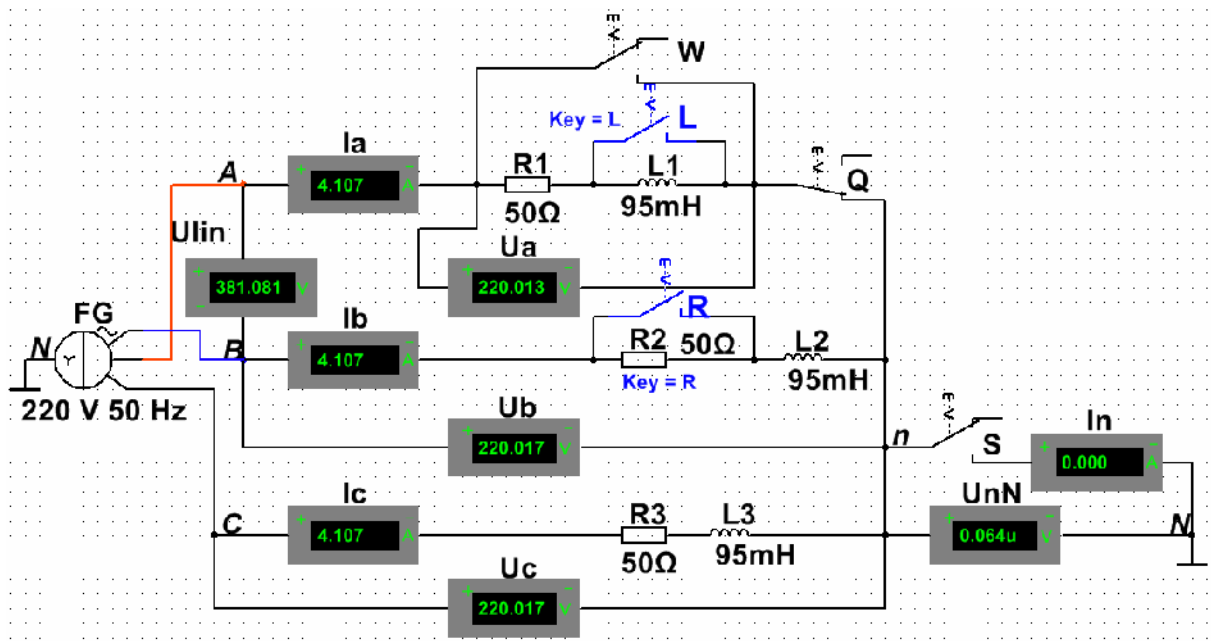




I, I I .

1. .
2. , ' -
3. .
4. .
- 5.

1. ?
2. ?
3. , ?
4. ' « »?
5. ,
6. « »?
7. ' « »? -
8. , « »?
9. ?
10. ?

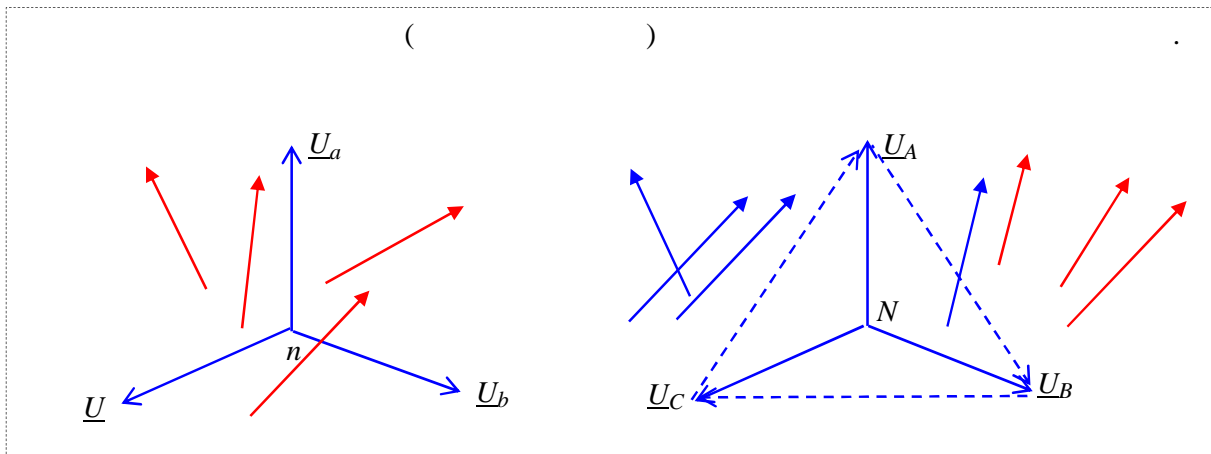


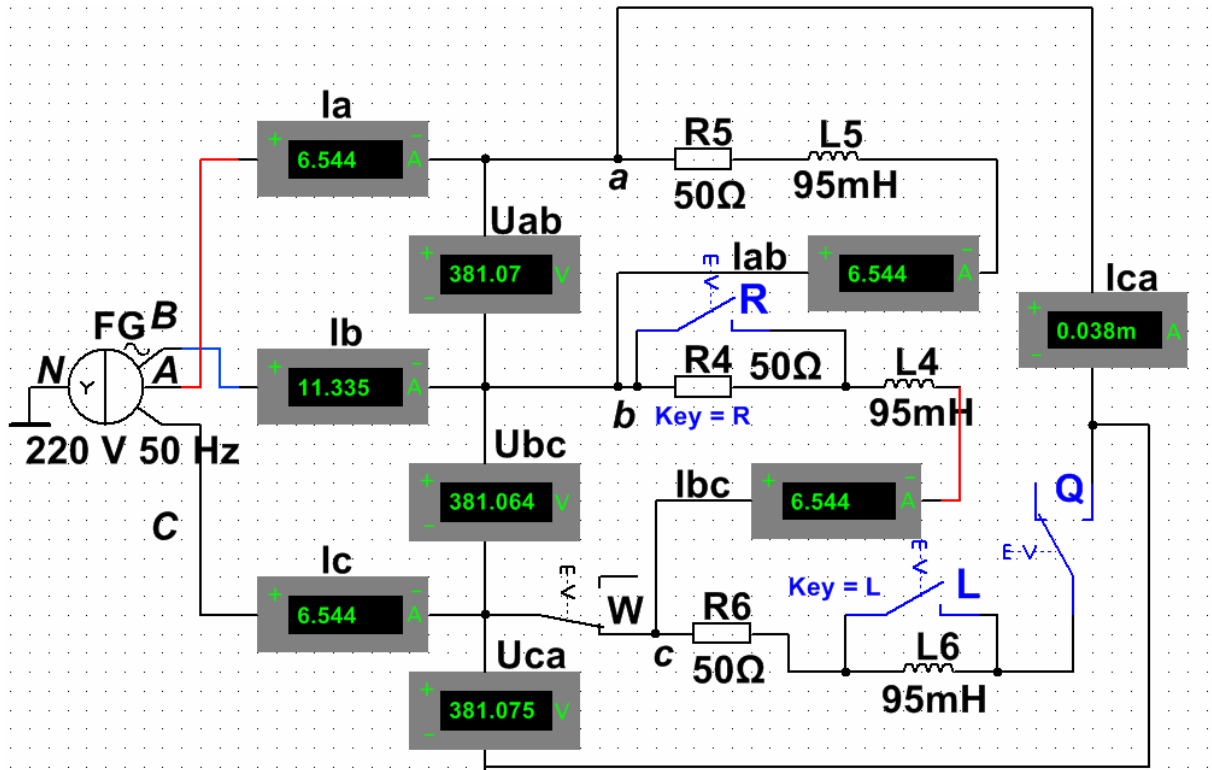
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12.4 –

Multisim

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12.5 -

Multisim

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