

12.1.

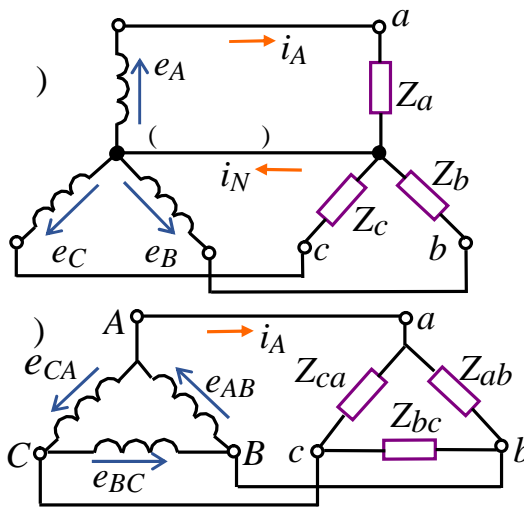
12.1.1.

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, , « » () (-

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« - »

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

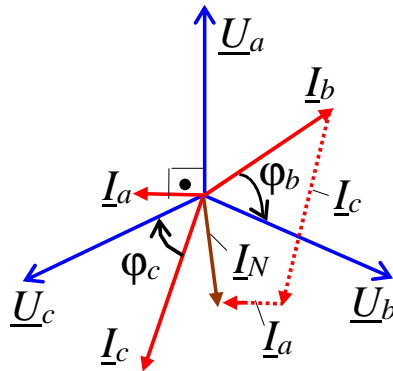
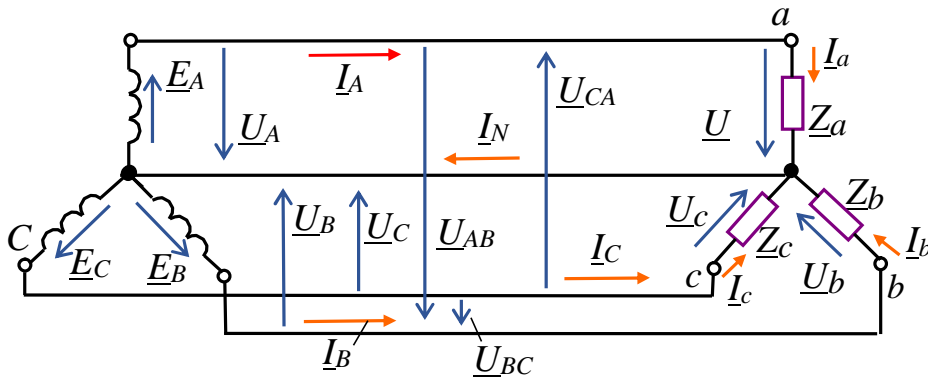
$$(\underline{U}_{o'o} = 0).$$

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

$$\sqrt{3}$$

$$U = 380 ,$$

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



12.2 -

() (),

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

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

$$\left(\quad \right) \underline{I} = \underline{U} / \underline{Z} = \underline{I} ,$$

$$\left(\text{12.2, } \right) \underline{I}_N = \underline{I}_a + \underline{I}_b + \underline{I}_c .$$

$$\left(\quad \right)$$

$$\left(\underline{Z}_a = \underline{Z}_b = \underline{Z}_c = \underline{Z} \right)$$

$$\underline{I} =$$

$$\underline{I} = \underline{U} / \underline{Z} .$$

$$\left(\quad \right),$$

:

$$\underline{I}_N = \underline{I}_a + \underline{I}_b + \underline{I}_c = 0,$$

,

« - » (Y-Y).

$$\underline{Y} \quad \left(\quad \right)$$

$$\left(\quad \right)$$

Y-

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,

$$\left(\quad \right)$$

12.2,) ,

$$\underline{U}_{O'O} = \frac{\underline{E}_A \underline{Y}_a + \underline{E}_B \underline{Y}_b + \underline{E}_C \underline{Y}_c}{\underline{Y}_a + \underline{Y}_b + \underline{Y}_c},$$

$$\underline{Y}_a = 1/\underline{Z}_a; \underline{Y}_b = 1/\underline{Z}_b; \underline{Y}_c = 1/\underline{Z}_c -$$

:

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

« »

(« »),

$$\underline{U}_a ,$$

,

$$\left(\quad \right),$$

$$\underline{U}_A$$

-

$$\underline{Z}_a = R , \underline{Z}_b = jX_L \quad \underline{Z}_c = -jX_C .$$

:

$$\underline{I}_a = \underline{U} / \underline{Z} ; \underline{I}_b = \underline{U}_b / \underline{Z}_b ; \underline{I}_c = \underline{U}_c / \underline{Z}_c ,$$

,

$$\underline{I}_a + \underline{I}_b + \underline{I}_c = 0 .$$

12.1.3. ,

12.3,

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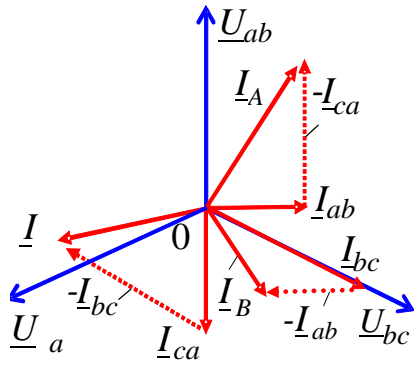
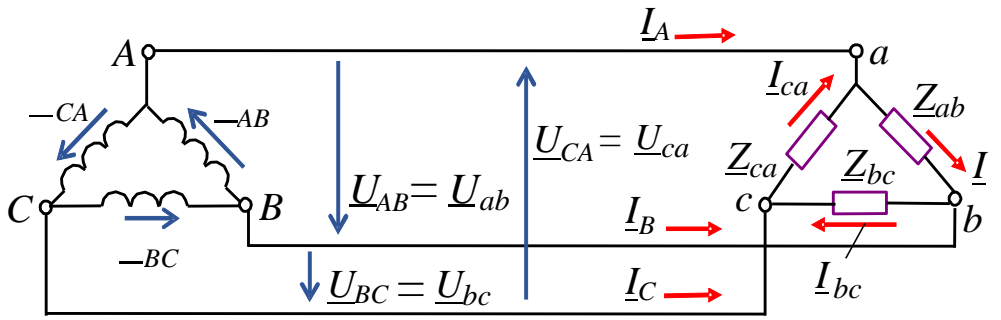
),

,

$$\underline{U} = \underline{U} ,$$

:

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



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, .

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

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

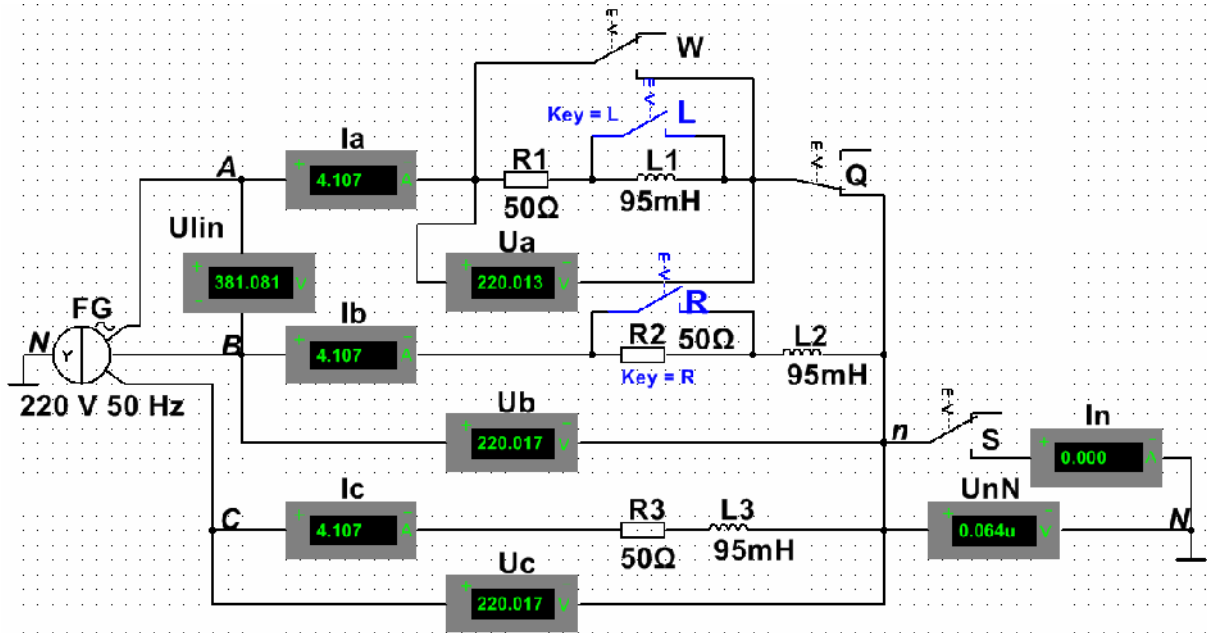
$$\underline{I}_{ab} + \underline{I}_{bc} + \underline{I}_{ca} = 0 \quad \underline{I}_A + \underline{I}_B + \underline{I}_C = 0,$$

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

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 ;
- :
- $\underline{Z}_a = \underline{Z}_b = \underline{Z}_c = R + jX_L = [(20 + N) + j(15 + N)]$, $N -$

Q, W S 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): $Z_a = 0$; $Z_b = +jX; Z_c = R + jX$									-

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$Z = R = 20$

()
 $-Z = R = 0,1$ ()

), $I() = 0$ ()

), 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. , « »?

11. ' « »?

12. ' « »?

13. ' « »?

14. ' « »?

15. ' « »?

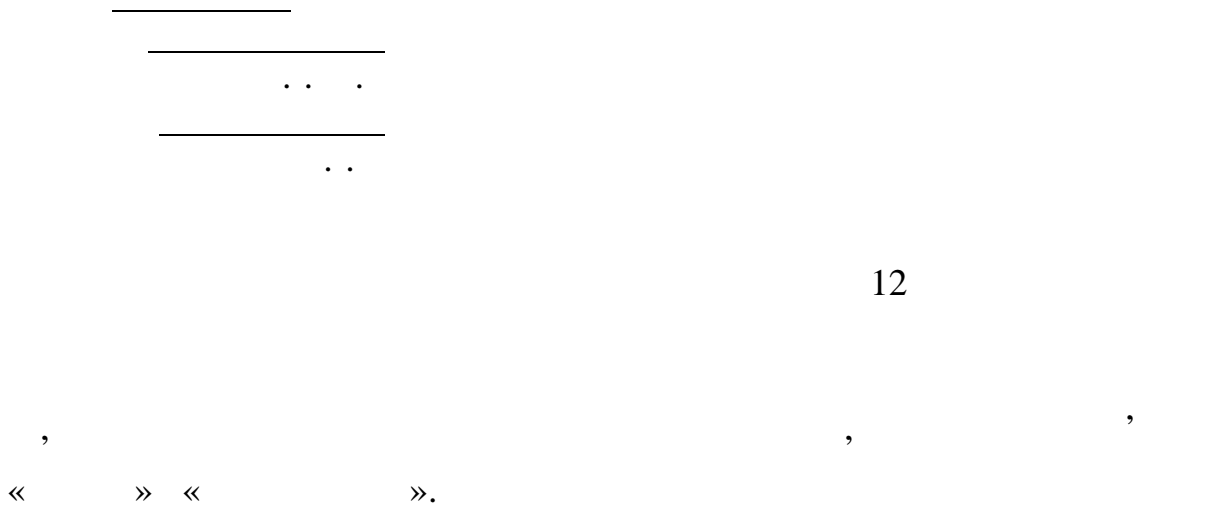
16. ' « »?

17. ' « »?

18. ' « »?

19. ' « »?

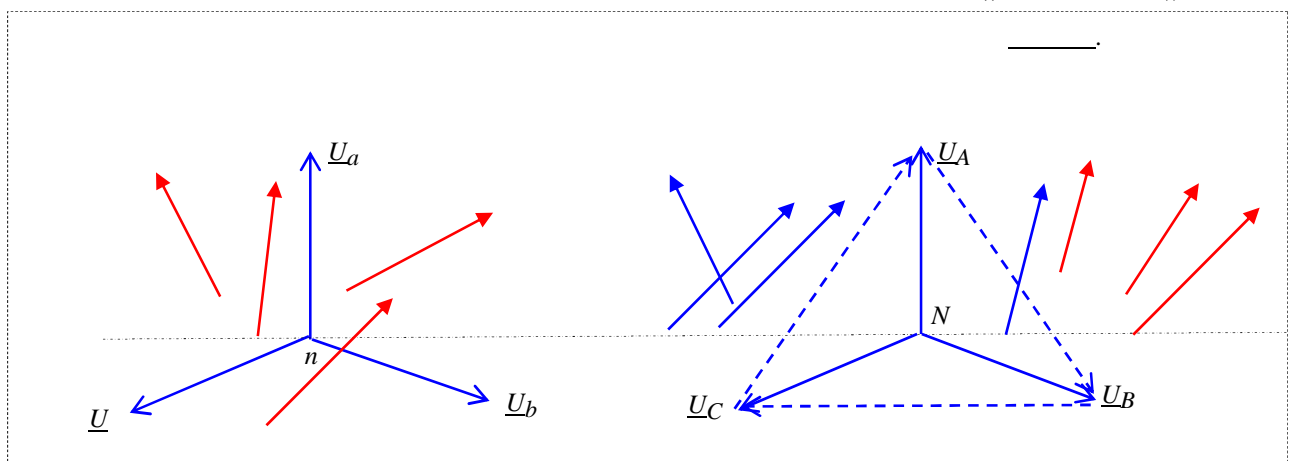
20. ' « »?

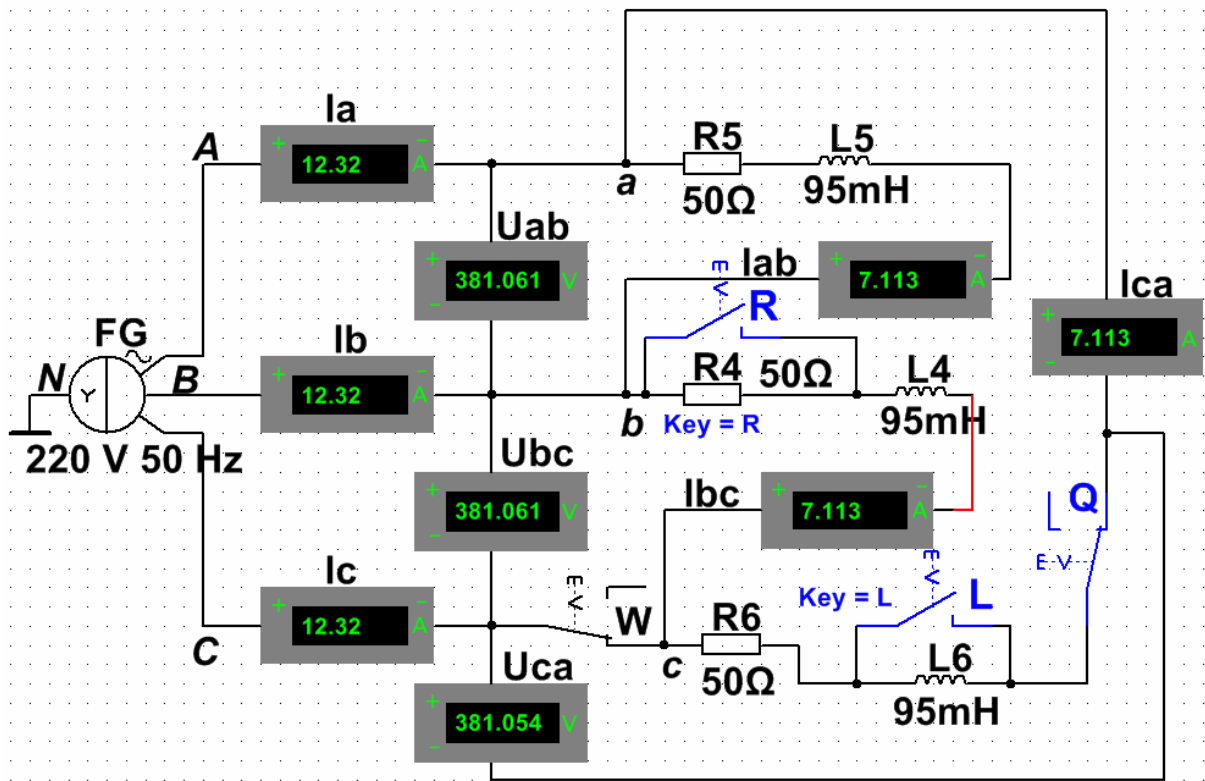


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12.4 –

Multisim





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12.5 –

Multisim

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