

A	
D	B
A	C
C	B
E (R-I)	B
E (34)	A
B	B
C	

B	
C	A
B	D
A	A
E	A
E	D
C	C
B	



$$1.) a) \underline{U}_1 = \underline{I}_{K1} \cdot (\underline{z}_1 + \underline{z}_2 + \underline{z}_4) - \underline{I}_{K2} \underline{z}_2 - \underline{I}_{K3}$$

$$\underline{I}_{K2} = -\underline{I}_5$$

$$-\underline{U}_6 = -\underline{I}_{K1} \underline{z}_4 - \underline{I}_{K2} \underline{z}_5 + \underline{I}_{K3} (\underline{z}_4 + \underline{z}_5 + \underline{z}_6)$$

$$1 = \underline{I}_{K1} \cdot (2-j) - (-j) \cdot (-j) - \underline{I}_{K3} \rightarrow 0 = \underline{I}_{K1} (2-j) - \underline{I}_{K3} \quad (1)$$

$$-j = -\underline{I}_{K1} - (-j) \cdot j + \underline{I}_{K3} \cdot (2+j) \rightarrow 1-j = -\underline{I}_{K1} + (2+j) \underline{I}_{K3} \quad (2)$$

$$(1) \cdot (2+j) + (2) \Rightarrow 1-j = 4 \cdot \underline{I}_{K1} \Rightarrow \underline{I}_{K1} = \frac{1-j}{4} \text{ (A)}$$

$$\Rightarrow \underline{I}_{K3} = (2-j) \underline{I}_{K1} = (2-j) \cdot \frac{1-j}{4} = \frac{1-3j}{4} \text{ (A)}$$

$$\Rightarrow \underline{I}_4 = -\underline{I}_{K1} + \underline{I}_{K3} = \frac{-1+j+1-3j}{4} = \frac{-2j}{4} = -0.5j \text{ A}$$

$$b) \underline{S}_6 = \underline{U}_6 \cdot \underline{I}_6^* = (\underline{I}_6 = -\underline{I}_{K3}) / = j \cdot \left(\frac{-1+3j}{4} \right)^* =$$

$$= j \cdot \frac{-1-3j}{4} = \frac{3-j}{4} \text{ (VA)} \Rightarrow Q_6 = -0.25 \text{ VAR}$$

$$2.) \text{Re}\{\underline{U} \cdot \underline{I}_3^*\} = \frac{\text{Re}\{\underline{U} \cdot \underline{I}_3^*\}}{\underline{U} \cdot \underline{I}_3} \Rightarrow \underline{U} \cdot \underline{I}_3 = 1 \quad (1)$$

OČITANJE W-metra
OČITANJE cos φ-metra

$$\underline{I}_3 = \underline{I}_1 \cdot \frac{\underline{z}_2}{\underline{z}_2 + \underline{z}_3} ; \underline{I}_1 = \frac{\underline{U}}{\underline{z}_{EKV}} ; \underline{z}_{EKV} = \underline{z}_1 + \underline{z}_2 \parallel \underline{z}_3 =$$

$$= \underline{z}_1 + \frac{\underline{z}_2 \underline{z}_3}{\underline{z}_2 + \underline{z}_3}$$

$$\underline{I}_3 = \underline{U} \cdot \frac{\frac{\underline{z}_2}{\underline{z}_2 + \underline{z}_3}}{\underline{z}_1 + \frac{\underline{z}_2 \underline{z}_3}{\underline{z}_2 + \underline{z}_3}} = \underline{U} \cdot \frac{\underline{z}_2}{\underline{z}_1 \underline{z}_2 + \underline{z}_2 \underline{z}_3 + \underline{z}_2 \underline{z}_3} \quad (2)$$

$$I_2 (2) \Rightarrow \text{PO APS. VARIJ. : } \underline{I}_3 = U \cdot \frac{|\underline{z}_2|}{|\underline{z}_1 \underline{z}_2 + \underline{z}_2 \underline{z}_3 + \underline{z}_3 \underline{z}_1|} \quad (3)$$

$$(1) \wedge (3) \Rightarrow \frac{1}{U} = U \cdot \frac{|\underline{z}_2|}{|\underline{z}_1 \underline{z}_2 + \underline{z}_2 \underline{z}_3 + \underline{z}_3 \underline{z}_1|}$$

$$\Rightarrow U = \sqrt{\frac{|\underline{z}_1 \underline{z}_2 + \underline{z}_2 \underline{z}_3 + \underline{z}_3 \underline{z}_1|}{|\underline{z}_2|}} = \sqrt{\left| \underline{z}_1 + \underline{z}_3 + \frac{\underline{z}_1 \underline{z}_3}{\underline{z}_2} \right|}$$

$$= \sqrt{\left| 1 + j + 1 - j + \frac{(1+j)(1-j)}{1} \right|} = \sqrt{|4|} = \underline{\underline{2(V)}}$$

$$3.) \quad \underline{z}_e = \underline{z}_G^* = 17 + j5 \, \Omega$$

a) E: real-Imag

$$b) \quad P = \operatorname{Re} \left\{ \frac{U^2}{(\underline{z}_e + \underline{z}_G)^*} \right\} = \operatorname{Re} \left\{ \frac{34^2}{34} \right\} = \underline{\underline{34 \text{ W}}} \quad (\underline{\underline{E}})$$

$$4.) \quad a) \quad \omega_R = \frac{1}{\sqrt{LC}} = 10^4 \frac{\text{rad}}{\text{s}} \quad (X_L = X_C)$$

$$b) \quad \frac{\underline{I}_L}{\underline{I}_C} = \frac{\frac{U'}{jX_L}}{\frac{U'}{-jX_C}} = -\frac{X_C}{X_L} = -1 = e^{j180^\circ}$$

$$5.) \underline{Y} = \frac{1}{R_1 - jX_C} + \frac{1}{jX_L} + \frac{1}{R_3} =$$

$$= \frac{R_1 + jX_C}{R_1^2 + X_C^2} - \frac{j}{X_L} + \frac{1}{R_3} \Rightarrow \text{Im}\{\underline{Y}\} = 0 = \frac{X_C}{R_1^2 + X_C^2} - \frac{1}{X_L}$$

$$\Rightarrow \underline{Y} - \text{Realno} \Rightarrow P = U \cdot I \Rightarrow U = 13,812 \text{ V}$$

$$\Rightarrow X_L = \frac{U}{I_2} = 6,906 \Omega \Rightarrow L = \frac{X_L}{2\pi f} = 2,198 \cdot 10^{-4} \text{ H}$$

$$6.) \underline{U}_{010} = \frac{\underline{U}_{10}}{R} + \frac{\underline{U}_{20}}{2R} + \frac{\underline{U}_{30}}{3R} = U_F \cdot \frac{1 + \frac{e^{-j120}}{2} + \frac{e^{j120}}{3}}{\frac{1}{R} + \frac{1}{2R} + \frac{1}{3R}} =$$

$$= U_F \cdot \frac{\frac{7 - j\sqrt{3}}{12}}{\frac{11}{6}} = U_F \cdot \frac{7 - j\sqrt{3}}{22}$$

$$\underline{I}_1 = \frac{\underline{U}_{10} - \underline{U}_{010}}{R} = \frac{U_F}{R} \left[1 - \frac{7 - j\sqrt{3}}{22} \right] = \frac{U_F}{R} \cdot \frac{15 + j\sqrt{3}}{22}$$

$$\underline{I}_3 = \frac{\underline{U}_{30} - \underline{U}_{010}}{3R} = \frac{U_F}{3R} \left[\left(-\frac{1}{2} + j\frac{\sqrt{3}}{2}\right) - \frac{7 - j\sqrt{3}}{22} \right] = \frac{U_F}{R} \cdot \frac{-6 + j4\sqrt{3}}{22}$$

$$a) P_{W1} = \text{Re}\left\{ \underline{U}_{12} \cdot \underline{I}_1^* \right\} = \text{Re}\left\{ U_F \sqrt{3} e^{j30^\circ} \cdot \frac{U_F}{22R} (15 - j\sqrt{3}) \right\} =$$

$$= \frac{24}{22} \cdot \frac{U_F^2}{R} \Rightarrow \frac{U_F^2}{R} = \frac{22}{24} \cdot 1000$$

$$P_{W2} = \text{Re}\left\{ \underline{U}_{32} \cdot \underline{I}_3^* \right\} = \text{Re}\left\{ j \cdot U_F \sqrt{3} \cdot \frac{U_F}{R} \cdot \frac{-6 - j4\sqrt{3}}{22} \right\} =$$

$$= \frac{12}{22} \cdot \frac{U_F^2}{R} = \frac{P_{W1}}{2} = 500 \text{ W}$$

b) Imacin ~~OK~~ - BILANS SNAGA :

$$P_T = \operatorname{Re}\{S_T\}, \quad S_T = S_G = \underline{U}_{10} \underline{I}_1^* + \underline{U}_{20} \underline{I}_2^* + \underline{U}_{30} \underline{I}_3^* =$$

$$= \underline{I}_2 = -(\underline{I}_1 + \underline{I}_3) = -\left(\frac{U_F}{R} \cdot \frac{15 + j\sqrt{3}}{22} + \frac{U_F}{R} \cdot \frac{-6 + j4\sqrt{3}}{22}\right) =$$

$$= \frac{U_F}{R} \cdot \frac{-9 - j5\sqrt{3}}{22} \quad \Bigg/ = \frac{U_F^2}{22R} \left[(15 - j\sqrt{3}) + e^{-j120}(-9 + 5j\sqrt{3}) + e^{j120}(-6 - 4j\sqrt{3}) \right]$$

$$= \frac{36}{22} \cdot \frac{U_F^2}{R} \quad \# = 1500 \text{ W}$$

II mecin - DIREKTNO :

$$S_T = \underline{U}_{10} \underline{I}_1^* + \underline{U}_{20} \underline{I}_2^* + \underline{U}_{30} \underline{I}_3^*$$

III mecin : KAKO JE $P_{W1} + P_{W2} = \operatorname{Re}\left\{ \underline{U}_{12} \underline{I}_1^* + \underline{U}_{32} \underline{I}_3^* \right\}$

$$= \operatorname{Re}\left\{ (\underline{U}_{10} - \underline{U}_{20}) \underline{I}_1^* + (\underline{U}_{30} - \underline{U}_{20}) \underline{I}_3^* \right\} = \operatorname{Re}\left\{ \underline{U}_{10} \underline{I}_1^* - \underline{U}_{20} (\underline{I}_2^* + \underline{I}_3^*) + \right.$$

$$\left. + \underline{U}_{30} \underline{I}_3^* \right\} = \operatorname{Re}\left\{ \underline{U}_{10} \underline{I}_1^* + \underline{U}_{20} \underline{I}_2^* + \underline{U}_{30} \underline{I}_3^* \right\} = P_T$$

$$\Rightarrow P_T = 1000 + 500 = 1500 \text{ W}$$

7.) a) KAKO SU NA POTROŠAČU



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LINIJSKI I FAZNI NAPONI $|S\bar{T}| \Rightarrow$ "C" i "D" SU NE TAČNI,

$$\text{KAKO JE: } \underline{I}_1 = \underline{I}_{12} - \underline{I}_{31} = \frac{U_{12} - U_{31}}{Z} = \frac{U_L}{Z} \cdot (1 - e^{j120^\circ}) =$$
$$= \frac{U_L}{Z} \sqrt{3} \left(\frac{\sqrt{3}}{2} - j\frac{1}{2} \right) = \frac{U_L}{Z} \sqrt{3} e^{-j30^\circ} = \underline{I}_{12} \sqrt{3} e^{-j30^\circ}$$

$$\text{ANALOGNO: } \underline{I}_2 = \underline{I}_{23} \sqrt{3} e^{-j30^\circ}$$

$$\underline{I}_3 = \underline{I}_{31} \sqrt{3} e^{-j30^\circ}$$

\Rightarrow LINIJSKE STRUJE KASNE ZA 30°

b) PRIJE OTVARANJA "S":

$$\underline{I}_1 = \underline{I}_2 = \underline{I}_3 = \frac{U_L}{Z} \cdot \sqrt{3}; \quad \underline{I}_{12} = \underline{I}_{23} = \underline{I}_{31} = \frac{U_L}{Z}$$

NAKON OTVARANJA "S":

$$\underline{I}_2 = \underline{I}_3 = \underline{I}_{12} = \underline{I}_{31} = \frac{U_L}{Z}, \quad \underline{I}_{23} = 0, \quad \underline{I}_1 = \frac{U_L}{Z} \sqrt{3},$$

$$\left. \begin{array}{l} \underline{I}_1 - \text{ISTO} \\ \underline{I}_2 \downarrow \\ \underline{I}_3 \downarrow \end{array} \right\} \begin{array}{l} \underline{I}_{12} - \text{ISTO} \\ \underline{I}_{23} \downarrow \\ \underline{I}_{31} - \text{ISTO} \end{array}$$

NETAČAN PONUĐENI ODGOVOR JE DA SE \underline{I}_1 SMANJI

8.) NETAČNA JE SLIKA (B) KOD VAR. "A" I, ODMOSNO (C) KOD "B",
JER NA DIAGRAMU SToji: $\underline{I}_2 = \underline{I}_{23} + \underline{I}_{12}$ ŠTO JE NETAČNO!