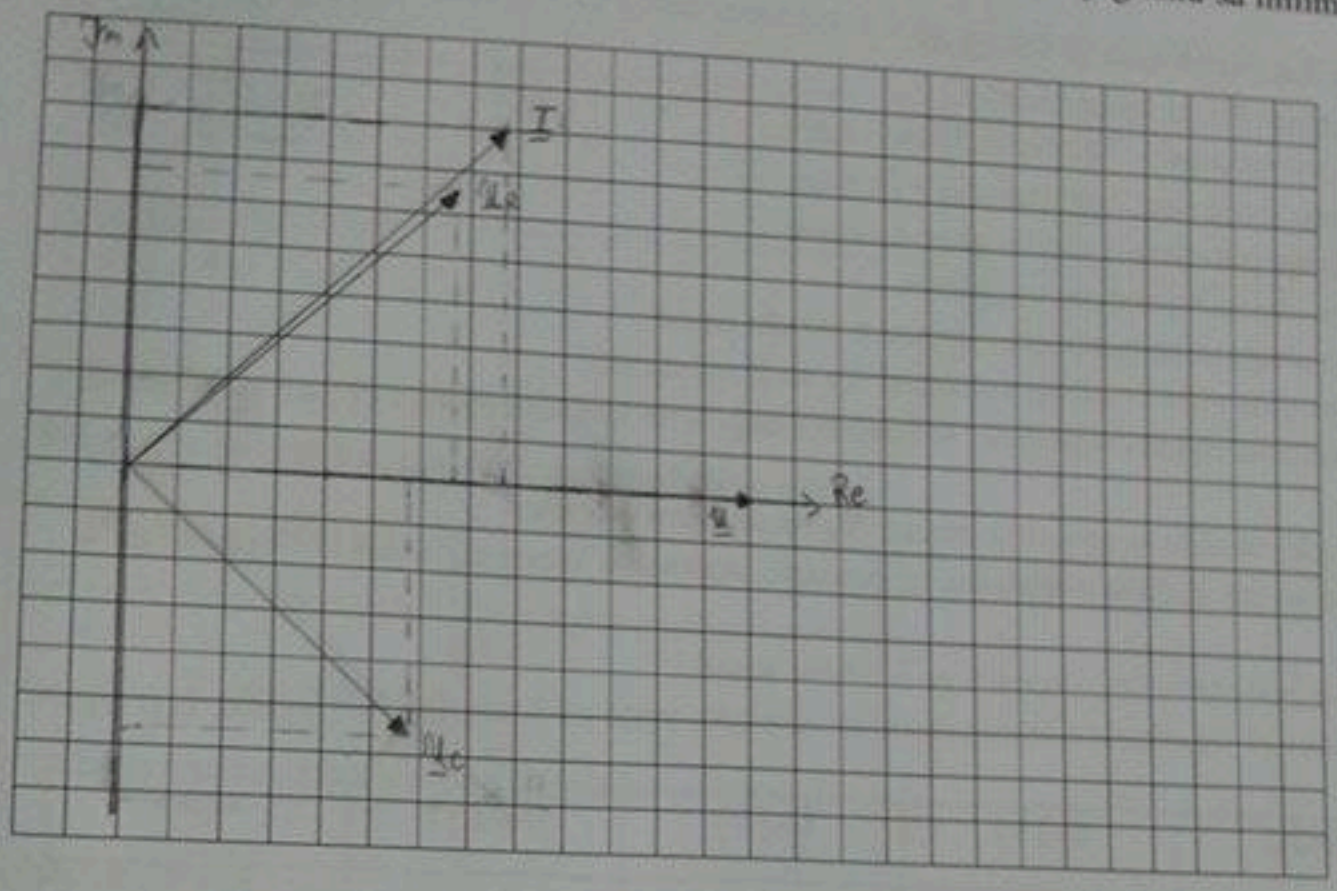
**Priprema za vježbu 1:** Prije dolaska na vježbu potrebno je da studenti proračunski odrede sljedeće veličine naizmjeničnog kruga, uzimajući u obzir da je $\underline{U}=30e^{j0}$:

| Tražena veličina | Relacija | Fazor veličine | Efektivna vrijednost |
|---|---|---|---|
| upna impedansa el. ga | $\underline{Z}=\underline{Z}_R+\underline{Z}_C=R-jX_C=$ $=R-j\frac{1}{\omega C}$ | $\underline{Z}=200-j199,04[\Omega]=$ $=282,165\cdot e^{-j44,86°}[\Omega]$ | $Z=\sqrt{200^2+199,04^2}=$ $=282,16[\Omega]$ |
| uja u el. krugu | $\underline{I}=\underline{U}/\underline{Z}_{ek}$ | $\underline{I}=30\cdot e^{j0°}/282,165\cdot e^{-j44,86°}=$ $=0,106\cdot e^{j44,86°}[A]$ | $I=\sqrt{0,075^2+0,07476^2}=$ $=0,106[A]$ |
| d napona na ndenzatoru | $\underline{U}_C=\underline{I}\,\underline{Z}_C$ | $\underline{U}_C=0,106e^{j44,86°}\cdot 199,04e^{-j90°}=$ $=21,09\cdot e^{-j45,14°}[V]$ | $U_C=21,09\ [V]$ |
| d napona na ivnom otporu | $\underline{U}_R=\underline{I}\cdot\underline{Z}_R$ | $\underline{U}_R=0,106e^{j44,86°}\cdot 200\cdot e^{j0°}=$ $=21,26\cdot e^{j44,86°}$ | $U_R=21,26[V]$ |
| d napona na rošaču | $\underline{U}_{RC}=\underline{U}_R+\underline{U}_C$ | $\underline{U}_{RC}=21,26\cdot e^{j44,86°}+21,09\cdot e^{-j45,14°}=$ $=15,017+j14,99+14,88-j14,94=$ $=29,92+j0,05[V]=$ $=29,92\cdot e^{j0,095°}[V]$ | $U_{RC}=29,92[V]$ |

| žena veličina | Relacija | Vrijednost |
|---|---|---|
| tor snage el. kruga | $\cos\varphi=P/\lvert\underline{S}\rvert=P/\sqrt{P^2+Q^2}$ $\underline{S}=\underline{U}_{RC}\cdot\underline{I}^*$ $P=\mathrm{Re}\{\underline{U}_{RC}\cdot\underline{I}^*\}$ | 0,7088 |
| o faznog pomaka između ona izvora i struje u el. krugu | $\varphi=\varphi_I-\varphi_u$ | 44,86° |

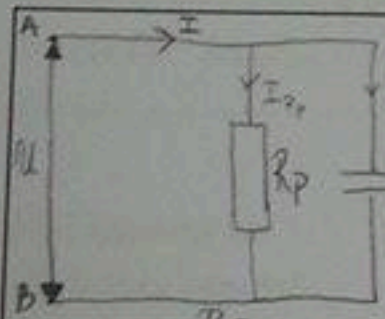
Nacrtati fazorski dijagram za računske veličine na priloženom dijagramu sa milimetarskom (5 x 5 mm) podjelom.




1 mm = 0,5 V

1 mm = 2 mA

Odrediti proračunski vrijednost otpora $R_P$ i kapacitet kondenzatora $C_P$, koji bi paralelno spojeni davali istu ukupnu struju u krugu pri istom naponu izvora (ukupna impedansa u kolu treba biti ista):




$$\frac{1}{\underline{Z}_{ek}} = \frac{1}{\underline{Z}_R} + \frac{1}{\underline{Z}_C} = \frac{1}{R_P} - \frac{\omega C}{j}\,\frac{(-j)}{(-j)}$$

$$\frac{1}{\underline{Z}_{ek}} = \frac{1}{R_P} + j\omega C_P = \frac{1 + j\omega R_P C_P}{R_P}$$

$$\underline{Z}_{ek} = \frac{R_P}{1 + j\omega C_P R_P} \cdot \frac{1 - j\omega C_P R_P}{1 - j\omega C_P R_P} = \frac{R_P - j\omega C_P R_P^2}{1 + \omega^2 R_P^2 C_P^2}$$

$$\underset{(Re)}{200} - j\underset{(Im)}{199{,}04} = \underset{(Re)}{\frac{R_P}{1 + \omega^2 R_P^2 C_P^2}} - j\underset{(Im)}{\frac{\omega C_P R_P^2}{1 + \omega^2 R_P^2 C_P^2}}$$

$$200 = \frac{R_P}{1 + \omega^2 R_P^2 C_P^2} \quad \wedge \quad 199{,}04 = \frac{\omega C_P R_P^2}{1 + \omega^2 R_P^2 C_P^2}$$

$$Re\{\underline{Z}\} \approx Im\{\underline{Z}\}$$

$$\frac{R_P}{1 + \omega^2 R_P^2 \frac{1}{\omega^2 C_P^2}} = 200 \Rightarrow \boxed{R_P = 400\,[\Omega]}$$

$$C_P = \frac{1}{\omega R_P} = \frac{1}{314 \cdot 400} \Rightarrow \boxed{C_P = 7{,}96\,[\mu F]}$$