

Grupa I.

$$u(t) = U_m \cdot \sin(\omega t + \varphi)$$

Wartość chwilowa napięcia = Amplituda napięcia * sin (pulsacja*czas + przesunięcie fazowe)

$$1. U = \frac{U_m}{\sqrt{2}} = \frac{325V}{1,41} = 230V$$

$$2. \omega = 314 \frac{rad}{s} \quad \omega = 2 \cdot \pi \cdot f \quad f = \frac{\omega}{2 \cdot \pi} = \frac{314 \frac{rad}{s}}{2 \cdot 3,14} = 50Hz$$

$$3. X_L = \omega \cdot L = 314 \frac{rad}{s} \cdot 0,1H = 31,4\Omega$$

$$4. X_C = \frac{1}{\omega C} = \frac{1}{314 \frac{rad}{s} \cdot 0,00001F} = 318\Omega$$

$$5. Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{100\Omega^2 + (31,4\Omega - 318)^2} = 304\Omega$$

$$6. I = \frac{U}{Z} = \frac{230V}{304\Omega} = 0,757A$$

$$7. U_R = I \cdot R = 0,757A \cdot 100\Omega = 75,7V$$

$$8. U_L = I \cdot X_L = 0,757A \cdot 31,4\Omega = 23,8V$$

$$9. U_C = I \cdot X_C = 0,757A \cdot 318\Omega = 241V$$

10. Wykres

$$11. f_{rez} = \frac{1}{2 \cdot \pi \sqrt{LC}} = \frac{1}{2 \cdot 3,14 \cdot \sqrt{0,1H \cdot 10\mu F}} = 159Hz$$

$$12. X_L = 2 \cdot \pi \cdot f_{rez} \cdot L = 2 \cdot 3,14 \cdot 159Hz \cdot 0,1H = 99,9\Omega$$

$$13. X_C = \frac{1}{2 \cdot \pi \cdot f_{rez} \cdot C} = \frac{1}{2 \cdot 3,14 \cdot 159Hz \cdot 0,00001} = 100\Omega$$

$$14. Z = R = 100\Omega$$

$$15. I = \frac{U}{Z} = \frac{230V}{100\Omega} = 2,30A$$

$$16. U_R = I \cdot R = 2,30A \cdot 100\Omega = 230V$$

$$17. U_L = I \cdot X_L = 2,3A \cdot 99,9\Omega = 230V$$

$$18. U_C = I \cdot X_C = 2,3A \cdot 100\Omega = 230V$$

19. Wykres

Połączenia równoległe gr. III

$$u(t) = U_m \cdot \sin(\omega t + \varphi)$$

Wartość chwilowa napięcia = Amplituda napięcia * sin (pulsacja*czas + przesunięcie fazowe)

$$1. U = \frac{U_m}{\sqrt{2}} = \frac{325V}{1,41} = 230V$$

$$2. f \quad \omega = 2 \cdot \pi \cdot f \quad f = \frac{\omega}{2 \cdot \pi} = \frac{314}{2 \cdot 3,14} = 50,0Hz$$

$$3. X_L = \omega \cdot L = 314 \frac{rad}{s} \cdot 0,4H = 126\Omega$$

$$4. X_C = \frac{1}{\omega C} = \frac{1}{314 \frac{rad}{s} \cdot 0,00004F} = 79,6\Omega$$

$$5. I_R = \frac{U}{R} = \frac{230V}{400\Omega} = 0,575A$$

$$6. I_L = \frac{U}{X_L} = \frac{230V}{126\Omega} = 1,83A$$

$$7. I_C = \frac{U}{X_C} = \frac{230V}{79,6\Omega} = 2,89A$$

$$8. I = \sqrt{I_R^2 + (I_L - I_C)^2} = \sqrt{0,575A^2 + (1,83A - 2,89A)^2} = 1,21A$$

$$9. Z = \frac{U}{I} = \frac{230V}{1,21A} = 190\Omega$$

10. Wykres

$$11. f_{rez} = \frac{1}{2 \cdot \pi \sqrt{LC}} = \frac{1}{2 \cdot 3,14 \cdot \sqrt{0,4H \cdot 40\mu F}} = 39,8Hz$$

$$12. X_L = 2 \cdot \pi \cdot f_{rez} \cdot L = 2 \cdot 3,14 \cdot 39,8Hz \cdot 0,4H = 100\Omega$$

$$13. X_C = \frac{1}{2 \cdot \pi \cdot f_{rez} \cdot C} = \frac{1}{2 \cdot 3,14 \cdot 159Hz \cdot 0,00004F} = 100\Omega$$

14. Zostawiamy na później

15. Zostawiamy na później

$$16. I_R = \frac{U}{R} = \frac{230V}{400\Omega} = 0,575A$$

$$17. I_L = \frac{U}{X_L} = \frac{230V}{100\Omega} = 2,30A$$

$$18. I_C = \frac{U}{X_C} = \frac{230V}{100\Omega} = 2,30A \quad \text{i wracamy do}$$

$$15. I = \sqrt{I_R^2 + (I_L - I_C)^2} = \sqrt{0,575A^2 + (2,30A - 2,30A)^2} = 0,575A$$

$$\text{I wracamy do 14. } Z = \frac{U}{I} = \frac{230V}{0,575A} = 400\Omega$$

19. Wykres