

PELP1 Z13 Podstawowe wiadomości dotyczące przebiegów zmiennych

Zadanie 1. Wyznaczyć parametry czasowe (okres, częstotliwość, czas narastania i czas opadania) i amplitudowe (wartość średnią, skuteczną międzyszczytową i maksymalną) przebiegów:

$$\begin{array}{lll} (a) & (b) & (c) \\ x(t) = 3 \text{ V} \cdot \Pi_{0,5} \left(1 \frac{\text{krad}}{\text{s}} \cdot t + \frac{\pi}{2} \text{ rad} \right) & x(t) = 4 \text{ V} + 3 \text{ V} \cdot \Pi_{0,5} \left(2 \frac{\text{Mrad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) & x(t) = 4 \text{ V} + 3 \text{ V} \cdot \Pi_{0,3} \left(4 \frac{\text{krad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) \end{array}$$

$$\text{Odp.: } T = 2\pi \approx 6,28 \text{ ms},$$

$$f = \frac{1}{2\pi} \approx 159 \text{ Hz},$$

$$t_n = 0 \text{ s}, t_o = 0 \text{ s},$$

$$X_{\text{sr}} = 1,5 \text{ V}, X_{\text{sk}} = \sqrt{4,5} \approx 2,12 \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 3 \text{ V}$$

$$\text{Odp.: } T = \pi \approx 3,14 \mu\text{s},$$

$$f = \frac{1}{\pi} \approx 318 \text{ kHz},$$

$$t_n = 0 \text{ s}, t_o = 0 \text{ s},$$

$$X_{\text{sr}} = 5,5 \text{ V}, X_{\text{sk}} = \sqrt{32,5} \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 7 \text{ V}$$

$$\text{Odp.: } T = \frac{\pi}{2} \approx 1,57 \text{ s},$$

$$f = \frac{2}{\pi} \approx 637 \text{ mHz},$$

$$t_n = 0 \text{ s}, t_o = 0 \text{ s},$$

$$X_{\text{sr}} = 4,9 \text{ V}, X_{\text{sk}} = \sqrt{25,9} \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 7 \text{ V}$$

$$\begin{array}{lll} (d) & (e) & (f) \\ x(t) = 3 \text{ V} \cdot \Lambda_{0,5} \left(1 \frac{\text{krad}}{\text{s}} \cdot t + \frac{\pi}{2} \text{ rad} \right) & x(t) = 5 \text{ V} + 3 \text{ V} \cdot \Lambda_{0,5} \left(2 \frac{\text{Mrad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) & x(t) = 5 \text{ V} + 3 \text{ V} \cdot \Lambda_{0,3} \left(4 \frac{\text{rad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) \end{array}$$

$$\text{Odp.: } T = 2\pi \approx 6,28 \text{ ms},$$

$$f = \frac{1}{2\pi} \approx 159 \text{ Hz},$$

$$t_n = 0,8\pi \text{ ms}, t_o = 0,8\pi \text{ ms},$$

$$X_{\text{sr}} = 1,5 \text{ V}, X_{\text{sk}} = \sqrt{3} \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 3 \text{ V}$$

$$\text{Odp.: } T = \pi \approx 3,14 \mu\text{s},$$

$$f = \frac{1}{\pi} \approx 318 \text{ kHz},$$

$$t_n = 0,4\pi \mu\text{s}, t_o = 0,4\pi \mu\text{s},$$

$$X_{\text{sr}} = 6,5 \text{ V}, X_{\text{sk}} = \sqrt{43} \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 8 \text{ V}$$

$$\text{Odp.: } T = \frac{\pi}{2} \approx 1,57 \text{ s},$$

$$f = \frac{2}{\pi} \approx 637 \text{ mHz},$$

$$t_n = 0,12\pi \text{ s}, t_o = 0,28\pi \text{ s},$$

$$X_{\text{sr}} = 6,5 \text{ V}, X_{\text{sk}} = \sqrt{43} \text{ V},$$

$$X_{\text{pp}} = 3 \text{ V}, X_{\text{max}} = 8 \text{ V}$$

$$\begin{array}{lll} (g) & (h) & (i) \\ x(t) = 3 \text{ V} \cdot \sin \left(1 \frac{\text{krad}}{\text{s}} \cdot t + \frac{\pi}{2} \text{ rad} \right) & x(t) = 5 \text{ V} + 3 \text{ V} \cdot \sin \left(2 \frac{\text{Mrad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) & x(t) = 5 \text{ V} + 3 \text{ V} \cdot \cos \left(4 \frac{\text{rad}}{\text{s}} \cdot t + \frac{\pi}{4} \text{ rad} \right) \end{array}$$

$$\text{Odp.: } T = 2\pi \approx 6,28 \text{ ms},$$

$$f = \frac{1}{2\pi} \approx 159 \text{ Hz},$$

$$X_{\text{sr}} = 0 \text{ V}, X_{\text{sk}} = \frac{3}{\sqrt{2}} \text{ V},$$

$$X_{\text{pp}} = 6 \text{ V}, X_{\text{max}} = 3 \text{ V}$$

$$\text{Odp.: } T = \pi \approx 3,14 \mu\text{s},$$

$$f = \frac{1}{\pi} \approx 318 \text{ kHz},$$

$$X_{\text{sr}} = 5 \text{ V}, X_{\text{sk}} = \sqrt{\frac{59}{2}} \text{ V},$$

$$X_{\text{pp}} = 6 \text{ V}, X_{\text{max}} = 8 \text{ V}$$

$$\text{Odp.: } T = \frac{\pi}{2} \approx 1,57 \text{ s},$$

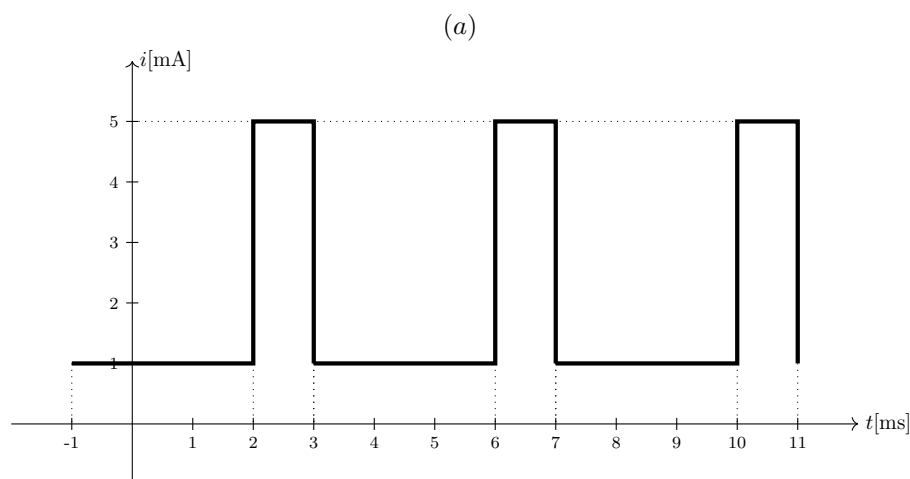
$$f = \frac{2}{\pi} \approx 637 \text{ mHz},$$

$$X_{\text{sr}} = 5 \text{ V}, X_{\text{sk}} = \sqrt{\frac{59}{2}} \text{ V},$$

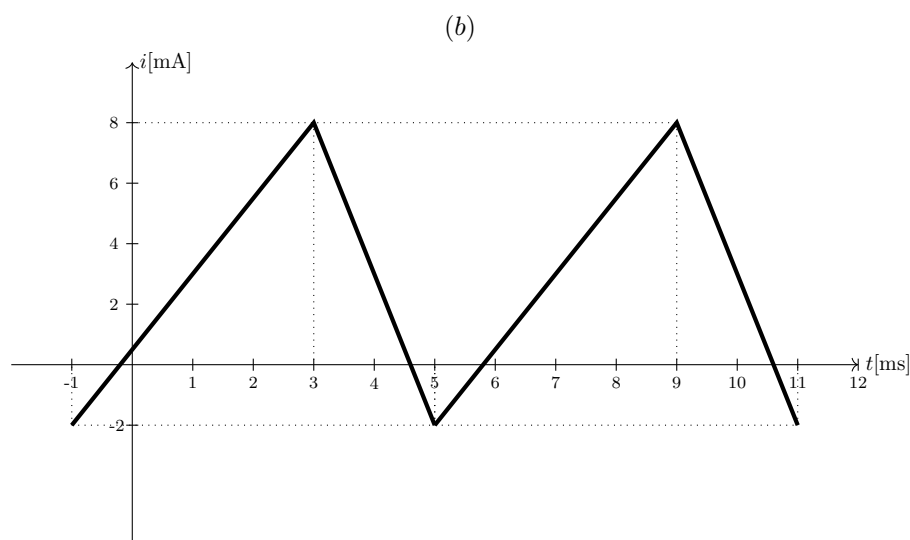
$$X_{\text{pp}} = 6 \text{ V}, X_{\text{max}} = 8 \text{ V}$$



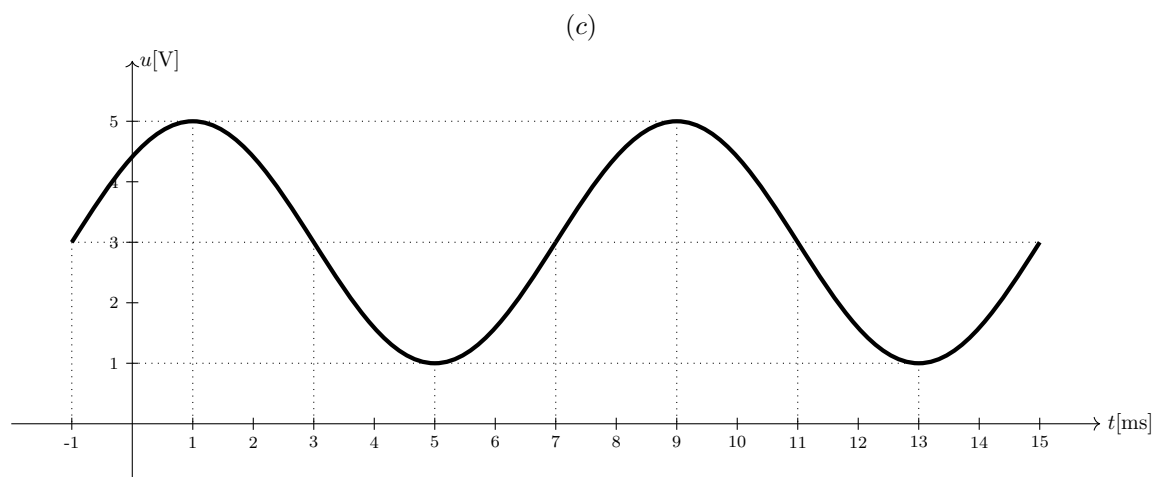
Zadanie 2. Wyznaczyć parametry czasowe (okres, częstotliwość, czas narastania, czas opadania i współczynnik wypełnienia) i amplitudowe (wartość średnią, skuteczną i międzyszczytową oraz współczynnik kształtu i szczytu) przebiegów:



Odp.: $T = 4 \text{ ms}$, $f = 250 \text{ Hz}$, $t_n = 0 \text{ s}$, $t_o = 0 \text{ s}$, $\delta = 0,25$, $I_{sr} = 2 \text{ mA}$, $I_{sk} = \sqrt{7} \text{ mA}$, $I_{pp} = 4 \text{ mA}$, $k_k = \frac{\sqrt{7}}{2}$, $k_a = \frac{5}{\sqrt{7}}$



Odp.: $T = 6 \text{ ms}$, $f \approx 167 \text{ Hz}$, $t_n = 3,2 \text{ ms}$, $t_o = 1,6 \text{ ms}$, $\delta = \frac{2}{3}$, $I_{sr} = 3 \text{ mA}$, $I_{sk} \approx 4,16 \text{ mA}$, $I_{pp} = 10 \text{ mA}$, $k_k \approx 1,22$, $k_a \approx 1,92$



Odp.: $T = 6 \text{ ms}$, $f \approx 167 \text{ Hz}$, $U_{sr} = 3 \text{ volt}$, $U_{sk} = \sqrt{11} \text{ V}$, $X_{pp} = 4 \text{ V}$, $k_k = \frac{\sqrt{11}}{3}$, $k_a = \frac{5}{\sqrt{11}}$