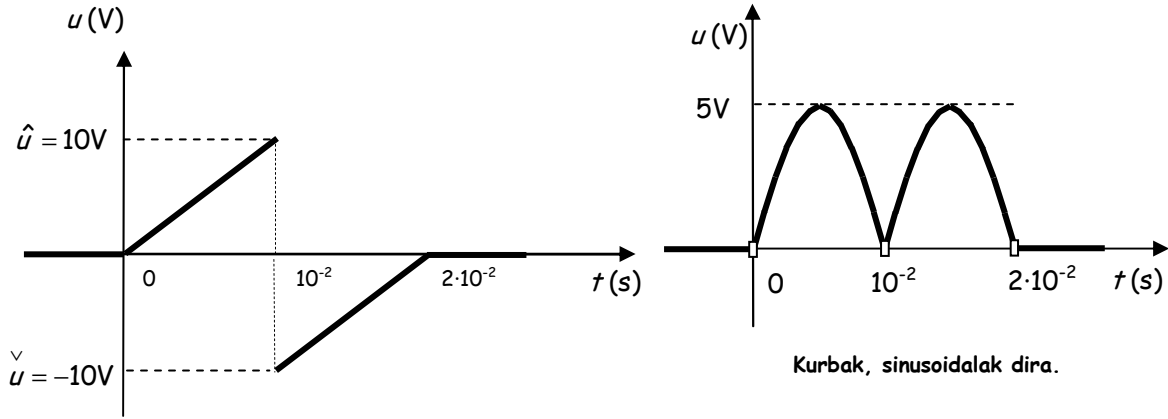


**Uhin formak, 5.ariketa**

- $i = 4\sqrt{2} \sin^2 100\pi t$  A, uhin-formari lotutako balioak zehaztu.
- Definitu analitikoki ondoko irudiei dagozkien uhin-formak.



- Aurreko uhin-formen maiztasuna eta forma-faktoreak zehaztu.

**EBAZPENA:**

- $i = 4\sqrt{2} \sin^2 100\pi t$  A uhin formari lotutako balioak:

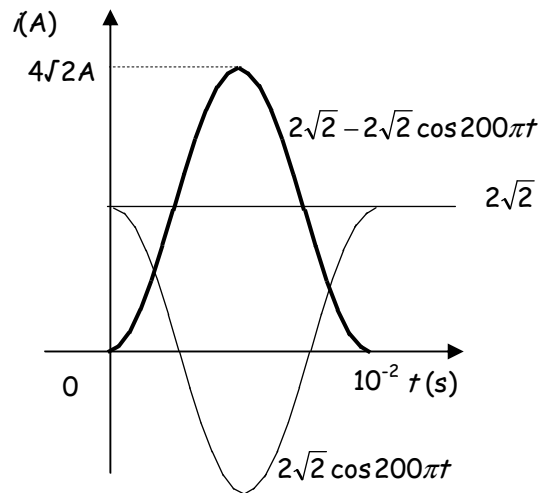
$$i = 4\sqrt{2} \sin^2 100\pi t \text{ A}; \sin^2 \alpha = \frac{1 - \cos 2\alpha}{2};$$

$$i = 4\sqrt{2} \left( \frac{1 - \cos 200\pi t}{2} \right) = i = 2\sqrt{2} - 2\sqrt{2} \cos 200\pi t \text{ A}$$

$$T = 10\text{ms}; f = \frac{1}{10 \cdot 10^{-3}} = 100\text{Hz}$$

$$\hat{i} = 4\sqrt{2} \text{ A}$$

$$\checkmark i = 0 \text{ A}$$



$i$  funtzioa definitu positiboa denez, uhinaren batez besteko balioa, uhin arteztuaren batez besteko balioarekin bat dator:

$$|\bar{i}| = \bar{i} = \frac{1}{10^{-2}} \int_0^{10^{-2}} 4\sqrt{2} \sin^2 100\pi t \, dt = 400\sqrt{2} \int_0^{10^{-2}} \frac{1 - \cos 200\pi t}{2} \, dt =$$

$$200\sqrt{2} \left[ t - \frac{\sin 200\pi t}{200\pi} \right]_0^{10^{-2}} = \frac{200\sqrt{2}}{100} = 2\sqrt{2} \text{ A}$$

$\checkmark$ -ren batez besteko balioa zehazteko beste modu bat:

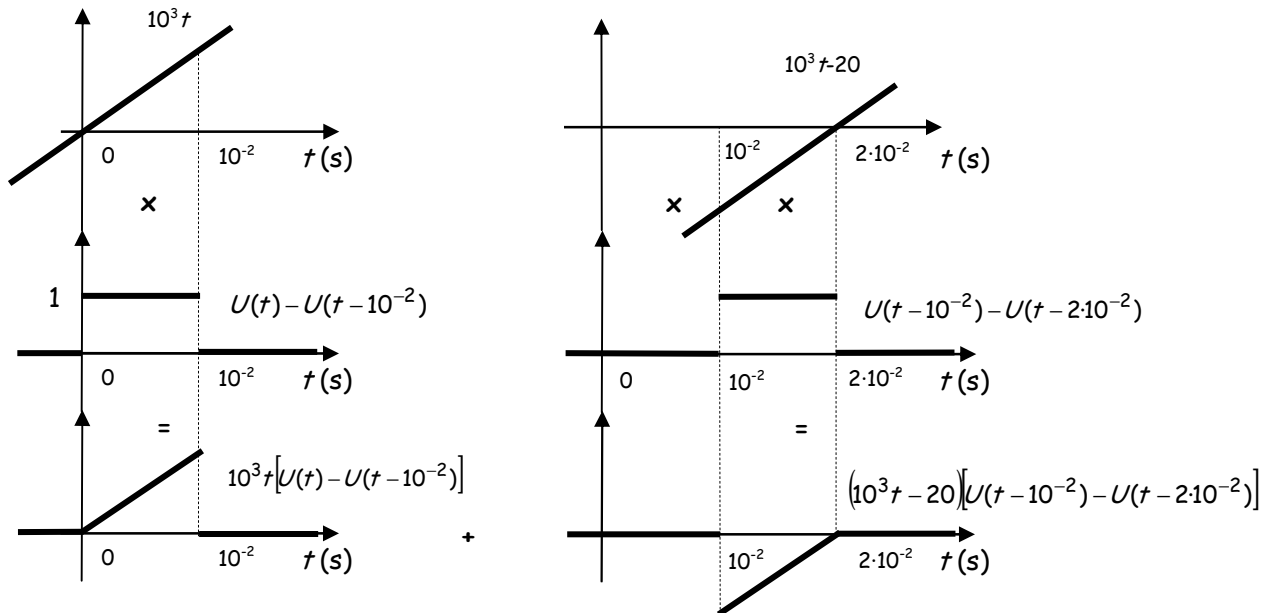
$i = 2\sqrt{2} - 2\sqrt{2} \cos 200\pi t$  A adierazpena abiapuntu bezala hartuz. Aipatutako adierazpenaren bigarren batugaiaren ( $2\sqrt{2} \cos 200\pi t$ ) batez besteko balioa nulu denez, batez besteko balioa, konstantea den lehen batugaiaren balioarekin bat etorriko da:  $2\sqrt{2}$ ,  $\bar{i} = 2\sqrt{2}A$

## 2 Definitu analitikoki uhin-formak

### 2.1 Uhin-forma triangeluarra:

$$u(t) = \begin{cases} 0 \geq t \text{ s} & u(t) = 0 \text{ V} \\ 0 \leq t < 10^{-2} \text{ s} & u(t) = 10^3 t \text{ V} \\ 10^{-2} < t \leq 2 \cdot 10^{-2} \text{ s} & u(t) = 10^3 t - 20 \text{ V} \\ t \geq 2 \cdot 10^{-2} \text{ s} & u(t) = 0 \text{ V} \end{cases}$$

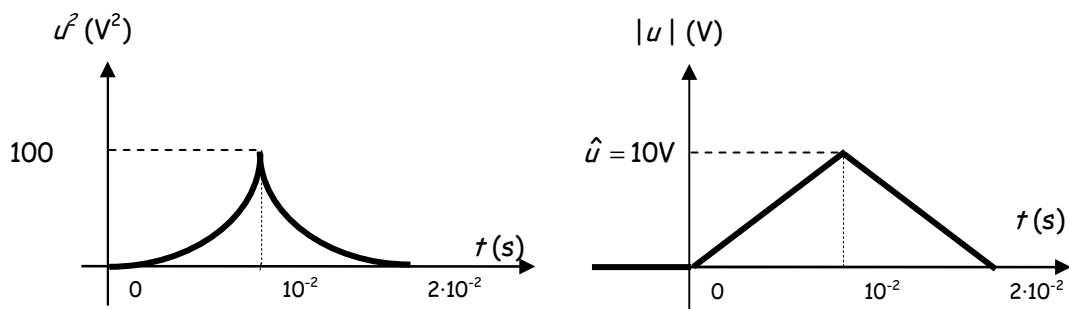
Inputso bat da, ez dauka maiztasunik, uhin periodikoa ez delako.



Beraz:  $u = 10^3 t [U(t) - U(t - 10^{-2})] + (10^3 t - 20) [U(t - 10^{-2}) - U(t - 2 \cdot 10^{-2})]$  V

### 3.1 Forma faktorea

$$K_F = \frac{U}{|u|}$$



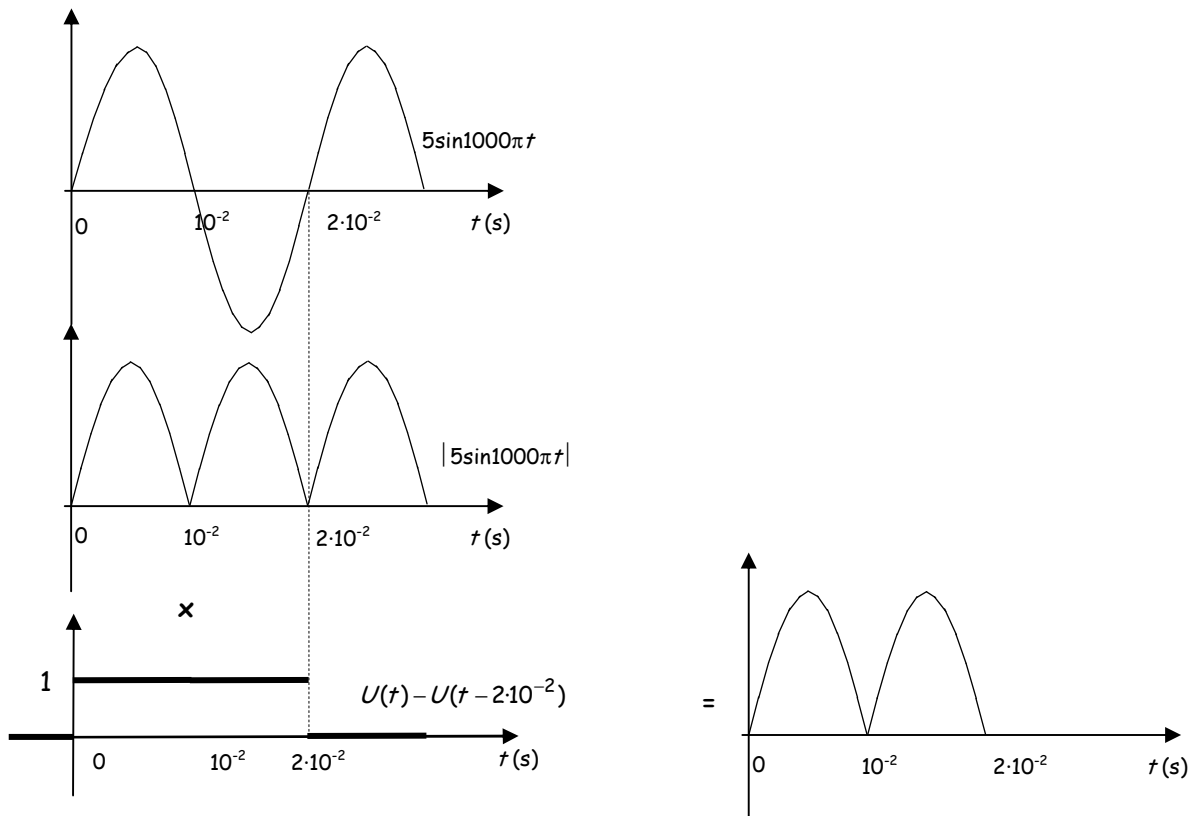
$$K_F = \frac{\sqrt{\frac{\frac{1}{3}100 \cdot 10^{-2}}{10^{-2}}}}{\frac{\frac{1}{2}10 \cdot 10^{-2}}{10^{-2}}} = \frac{\frac{10}{\sqrt{3}}}{\frac{1}{2}10} = \frac{2}{\sqrt{3}}$$

## 2.2 Uhin forma sinusoidal arteztua:

$$T = 2 \cdot 10^{-2} \text{ s}$$

$$\omega T = 2 \cdot \pi \longrightarrow \omega = \frac{2\pi}{2 \cdot 10^{-2}} = 1000 \frac{\text{rad}}{\text{s}}$$

$$u(t) = \begin{cases} 0 \geq t \text{ s} & u(t) = 0 \text{ V} \\ 0 \leq t \leq 10^{-2} \text{ s} & u(t) = 5 \sin 1000 \pi t \text{ V} \\ 10^{-2} \leq t \leq 2 \cdot 10^{-2} \text{ s} & u(t) = -5 \sin 1000 \pi t \text{ V} \\ t \geq 2 \cdot 10^{-2} \text{ s} & u(t) = 0 \text{ V} \end{cases}$$



Uhin-formaren ekuazioa:

$$u = |5 \sin 1000 \pi t| [U(t) - U(t - 2 \cdot 10^{-2})]$$

Balio efikaza:

$$U = \sqrt{\frac{1}{\pi} \int_0^{\pi} 25 \sin^2 \alpha \, d\alpha} = \sqrt{\frac{25}{\pi} \int_0^{\pi} \left( \frac{1 - \cos 2\alpha}{2} \right) d\alpha} = \sqrt{\frac{25}{2\pi} \left[ \alpha + \frac{\sin 2\alpha}{2} \right]_0^{\pi}} = \sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \text{ V}$$

Balio efikaza lortzeko beste era bat:

$$u^2 = 25 \sin^2 \alpha = 25 \left( \frac{1 - \cos 2\alpha}{2} \right) = \frac{25}{2} - \frac{25}{2} \cos 2\alpha$$

$$\overline{u^2} = \frac{25}{2} \text{ V}^2$$

$$U = \sqrt{\overline{u^2}} = \sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \text{ V}$$

Uhin arteztuaren batez besteko balioa:

$$\overline{|u|} = \frac{1}{\pi} \int_0^{\pi} 5 \sin \alpha \, d\alpha = \frac{1}{\pi} 5 (-\cos \alpha) \Big|_0^{\pi} = \frac{10}{\pi}$$

### 3.2 Forma faktorea

$$\text{Forma faktorea: } K_F = \frac{\frac{5}{\sqrt{2}}}{\frac{10}{\pi}} = \frac{\pi}{2\sqrt{2}} = \frac{\pi\sqrt{2}}{4}$$