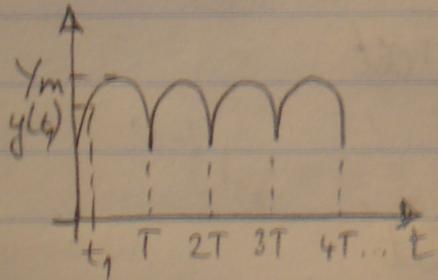


# USOJNE DICE VELICINE

## 13. TJEĐAN

- $t$  = nezavisna varijabla
- elek. veličine,  $U, I$  :
  1. vremenski nepromjenjivi (konst.)
  2. -/- promjenjivi
- Vremenski promjenjive
  1. neperiodičke
  2. periodičke
- $u(t)$  i  $i(t)$  = valni oblici
- PERIODIČKI PROMJENJIVA VELIČINA



$y(t_1)$  = trenutna vrijed.

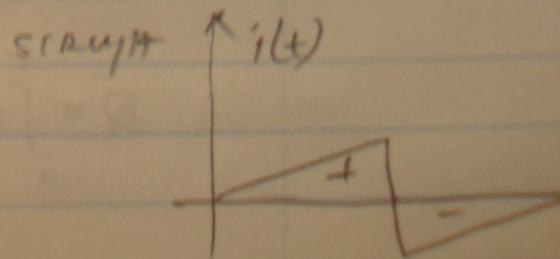
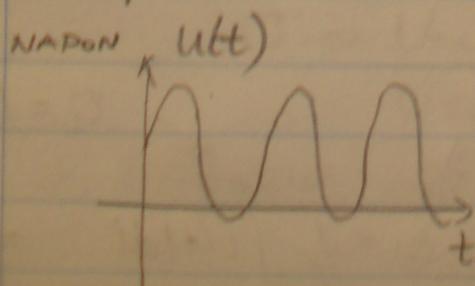
$T$  - perioda (s)

$f = 1/T$  frekv. (Hz)

$Y_m$  = max. vrijed. (fiksne)

$$y(t) = y(t+T) = \dots = y(t+kT) \quad k \in \mathbb{N}$$

- IZMENJIVE ELEK. VELIČINE



## • PARAMETARSKO KARATERIZ. PERIOD. VELIČINA

- opisuju se pomoću 1 parametra

- parametri:

1. Max. vrijednost

2. Perioda -  $T$  -

3. od vrha do vrha  $A_f$  -

4. efektivna -  $I_{sr}$  -

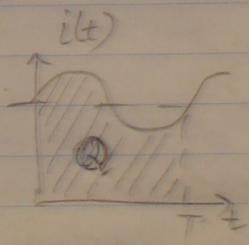
5. omjeri faktori

## • SREDNJA VRJEDNOST - definicija:

$$I_{sr} = \frac{1}{T} \int_0^T i(t) dt$$

$$U_{sr} = \frac{1}{T} \int_0^T u(t) dt$$

- fizikalni smisao:



$$Q = \int_0^T i(t) dt$$

$$Q = I_{sr} \cdot T$$

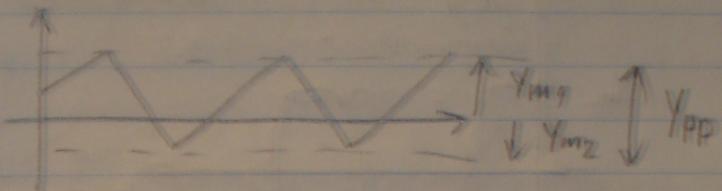
$$I_{sr} = \frac{1}{T} \int_0^T i(t) dt \Rightarrow \text{istovremeno kompozitno}$$

## • ELEKTROUT. SREDNJA VRJEDNOST

$$I_{el} = \frac{1}{T} \int_0^T i(t) dt$$

$$U_{el} = \frac{1}{T} \int_0^T u(t) dt$$

• OD VRHA DO VRHA - amplituda



$$Y_{pp} = Y_{max} - Y_{min} = \text{max} - \text{min}$$

• EPERIJUNA VRJEONOST

$$I_{eff} = I = \sqrt{\frac{1}{T} \int_0^T i^2(t) dt}$$

$$U_{eff} = U = \sqrt{\frac{1}{T} \int_0^T u^2(t) dt}$$

$$W = I_{eff}^2 \cdot R \cdot T$$

• OMJERNI FAKTORI

1. TEMENI FAKTOR

$$\sigma = \frac{I_m}{I_{eff}} = \sqrt{2} \quad (\text{za sinusoidal})$$

$$\sigma = \frac{U_m}{U_{eff}} = \sqrt{2}$$

2. FAKTOR OBRIKA

$$\xi = \frac{I_{eff}}{I_R}$$

$$\xi = \frac{U_{eff}}{U_R}$$

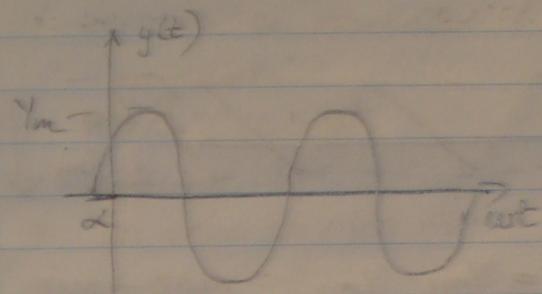
• OSNOVNI VALNI OBRIČI:

1. sinusni

2. pilasti

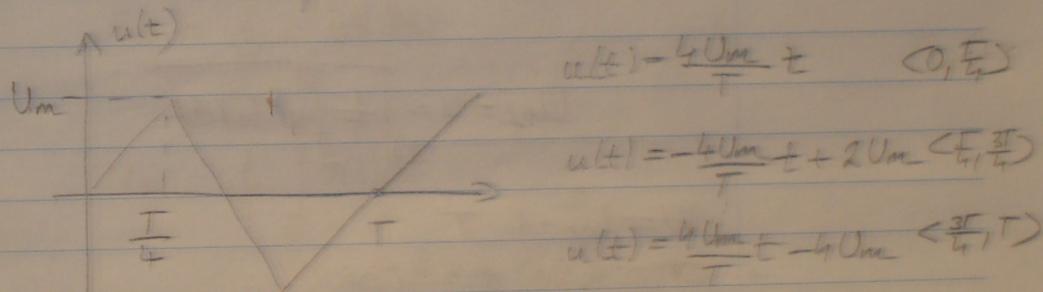
3. vremenski nepravljajući (konstantni)

- SINUSNI VALNI OBLIK



$$y(t) = Y_m \sin\left(\frac{2\pi}{T}t + \varphi\right) = Y_m \sin(\omega t + \varphi)$$

- PILASTI - izmjenjivanje

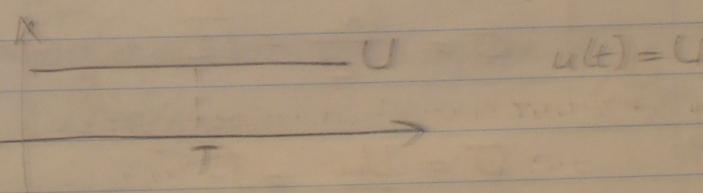


$$u(t) = \frac{4U_m}{T} t \quad (0, \frac{T}{4})$$

$$u(t) = -\frac{4U_m}{T} t + 2U_m \quad (\frac{T}{4}, \frac{3T}{4})$$

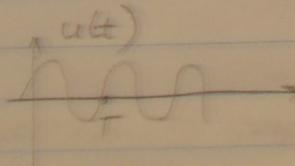
$$u(t) = \frac{4U_m}{T} t - 4U_m \quad (\frac{3T}{4}, T)$$

- KONSTANTNI - T se podizao na broj



- PARAMETRI:

a) SINUSNOG:

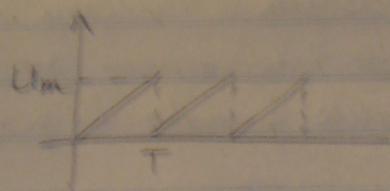


$$U_{sr} = 0$$

$$U = U_{ef} = \frac{U_m}{\sqrt{2}}$$

### b) PILASTI

#### 1. istospojno



ne ovise  
o f !!

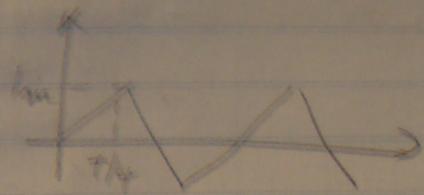
$$U_{SR} = \frac{U_m}{2}$$

$$U = U_{eff} = \frac{U_m}{\sqrt{3}}$$

$$\sigma = \sqrt{3}$$

$$\xi = \frac{2}{\sqrt{3}}$$

#### 2. lagnuticno



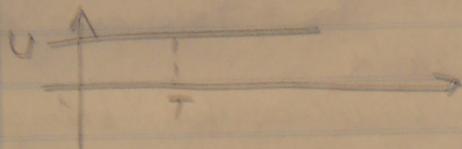
$$I_{SR} = 0$$

$$I_{eff} = \frac{I_m}{\sqrt{3}}$$

$$\sigma = \sqrt{3}$$

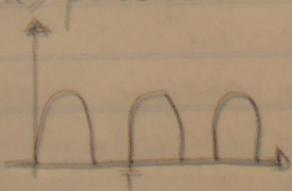
### c) KONSTATNI

$$U_{SR} = U = U_{eff}.$$



### • POLUVALNO/PUNOVALNO ISPRAVljENA SINUSOIDA

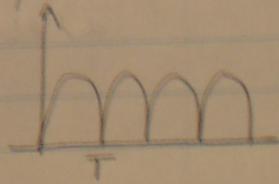
a) poluvalno



$$T = \frac{2\pi}{\omega}$$

$$I_{SR} = \frac{I_m}{\pi^2}$$

$$I = \frac{I_m}{2} = I_{eff}$$



$$T = \frac{\pi}{\omega}$$

$$I_{SR} = 2 \cdot \frac{I_m}{\pi^2}$$

$$I = \frac{I_m}{\sqrt{2}} = I_{eff}$$

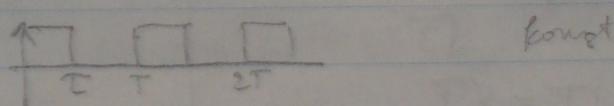
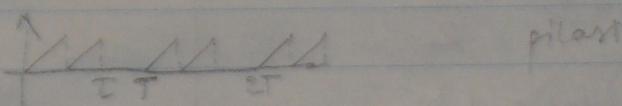
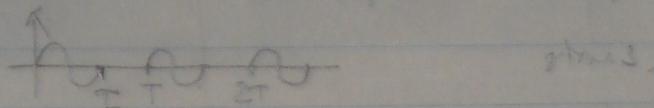
## • POSEBNI SUSTAVI VALNIH OBЛИKA:

### 1. periodički niz impulsa

- dobije se tako da se osnovni val "gasi"

u određenim intervalima pa dobijemo:

sinusoidalne, pustote ili pravokutne impulse



$T$  = period ponavljanja

$T$  = vrednost trajanja impulsa

$$\text{općenito: } Y_{\text{ef}} = Y_{\text{osnovni}} \cdot \sqrt{\frac{T}{F}}$$

$$Y_{\text{ef}} = Y_{\text{osnovni}} \cdot \sqrt{\frac{T}{F}}$$

### 2. složeni valni oblik

- zbroj više valnih oblika (komponenti)

- predstavljaju se zbrojem po vremenu nepreklapajućih (disjunktnih) impulsa

ili dodavanjem istosmjernih komponenti

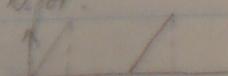
a) zbroj po vrem. nepr. im.

- kada je jedan aktivan  $\rightarrow$  dr. zgradi se  $\Rightarrow$

$$y(t) = y_1(t) + y_2(t) + \dots + y_N(t)$$

$$Y_{\text{ef}} = \sqrt{y_{1\text{ef}}^2 + y_{2\text{ef}}^2 + \dots + y_{N\text{ef}}^2}$$

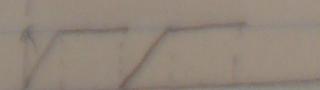
upor.



$$Y_{\text{ef}} = Y_{\text{osm}} \sqrt{\frac{T}{F}}$$



$$Y_{\text{ef}} = Y_{\text{osm}} \sqrt{\frac{T}{F}}$$

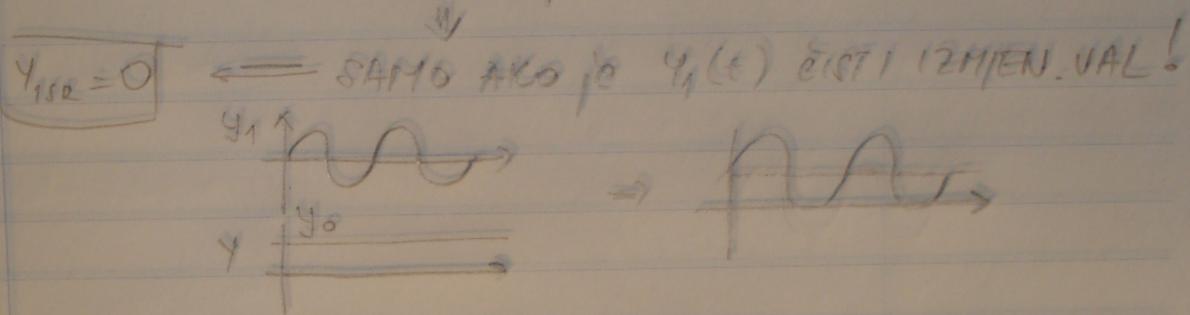


$$Y_{\text{ef}} = \sqrt{Y_{\text{ef}}^2 + Y_{\text{ef}}^2}$$

b) dodawanie istotnych kompo-

- dno biorącym zakres oblicz  $y_1(t)$   
dodawanie istotnych komponentów  $y_0(t) = Y$   
 $\Rightarrow y(t) = y_0(t) + y_1(t)$

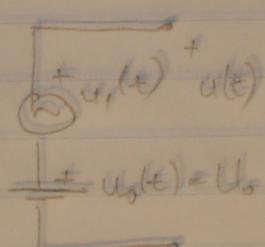
$$Y_{\text{ef}} = \sqrt{Y_0^2 + Y_1^2}$$



wyz.  $U_{\text{ef}} = ?$

$$u_1(t) = U_{1m} \sin \omega t$$

$$u(t) = u_0 + u_1(t)$$



$$U_{\text{ef}} = U = \sqrt{U_0^2 + \frac{U_{1m}^2}{2}}$$