

- Ηλ γραφ. portion.

- Τροφ. $230\text{ V} - 50\text{ Hz}$

- Πείρα:

- h_1 : 20 A α/α/α, φάση 30°

- 20% h_3

- 10% h_5

- DC συν. 10 A .

1) Μεθ. εύρεσης $v(t)$, $i(t)$.

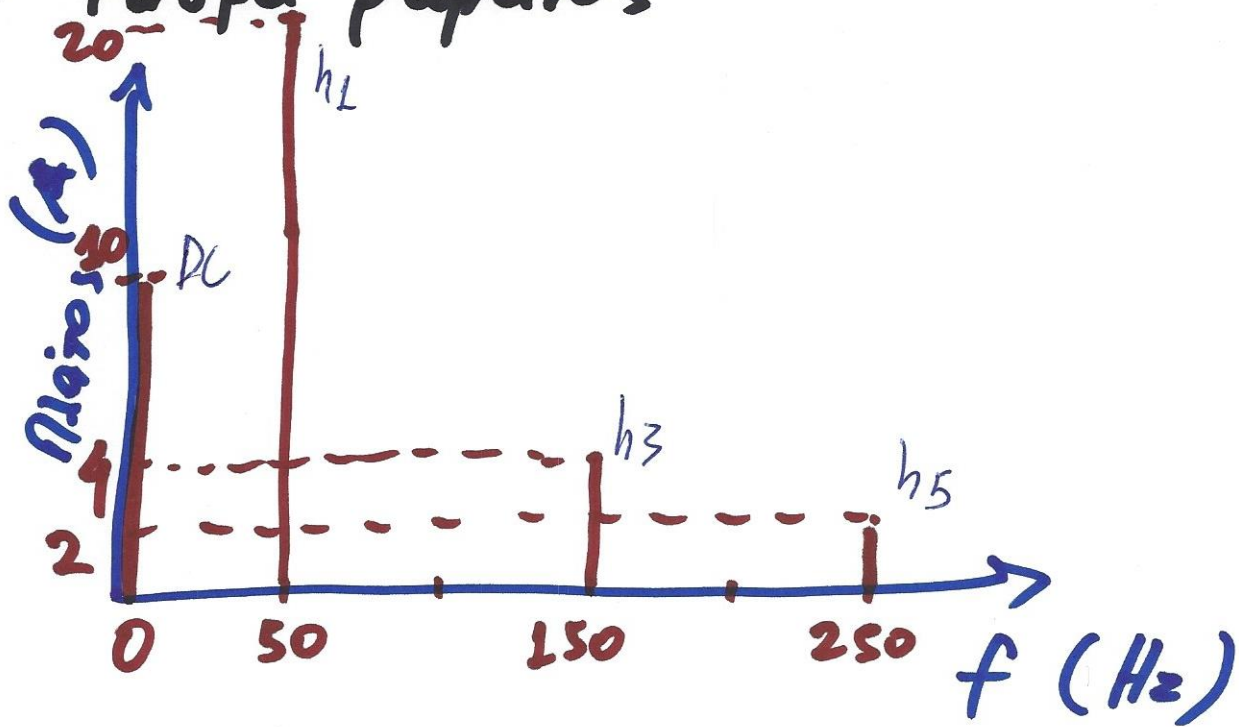
$$v(t) = 230\sqrt{2} \sin(2\pi \times 50 \times t) \text{ [V]}$$

$$i(t) = 10 + 20 \sin\left(2\pi \times 50 \times t - \frac{\pi}{6}\right) \dots$$

$$+ 0,2 \times 20 \sin(2\pi \times 150 \times t) \dots$$

$$+ 0,1 \times 20 \sin(2\pi \times 250 \times t) \text{ [A]}$$

2) Φάσμα ρεύματος



3) Μέση και RMS τιμή ρεύματος

$$\bar{I} = I_{DC} = 10 \text{ A.}$$

$$I_{RMS} = \sqrt{I_{DC}^2 + I_{1,RMS}^2 + I_{3,RMS}^2 + I_{5,RMS}^2}$$

$$\rightarrow I_{RMS} = \sqrt{I_{DC}^2 + \frac{\hat{I}_1^2}{2} + \frac{\hat{I}_3^2}{2} + \frac{\hat{I}_5^2}{2}}$$

$$\rightarrow I_{RMS} = \sqrt{10^2 + \frac{20^2}{2} + \frac{4^2}{2} + \frac{2^2}{2}}$$

$$= \sqrt{100 + 200 + 8 + 2}$$

$$= 17,61 \text{ A}$$

4) THD τάσης - πείρατος

$$THD_I = \frac{I_{dist, RMS}}{I_{1, RMS}} = \frac{\sqrt{I_{RMS}^2 - I_{1, RMS}^2}}{I_{1, RMS}}$$

$$\Rightarrow THD_I = \frac{\sqrt{17,61^2 - \frac{20^2}{2}}}{\left(\frac{20}{\sqrt{2}}\right)} = \frac{\sqrt{310 - 200}}{\left(\frac{20}{\sqrt{2}}\right)}$$

$$= 0,74 \text{ ή } 74\%$$

$$THD_V = \frac{0}{230} = 0 \quad . \quad (\text{καθαρό υγιτόνο})$$

5) PF_{dist} , DPF , PF_{true}

$$PF_{dist} = \frac{I_{1, RMS}}{I_{RMS}}$$

$$\Rightarrow PF_{dist} = \frac{20/\sqrt{2}}{17,61} = 0,8$$

$$DPF = \cos(\phi_1) \Rightarrow$$

$$DPF = \cos(30^\circ) = \frac{\sqrt{3}}{2} = 0,867$$

$$PF_{true} = \dots \times \dots$$

$$\Rightarrow PF_{true} \approx 0,7$$

6) Παράπλευρι ισχύς, P

$$P = S \cdot PF_{true}$$

$$S = V_{rms} \cdot I_{rms}$$

$$\Rightarrow S = 230 \times 17,61 = 4050 \text{ VA}$$

$$\Rightarrow P = 4050 \times 0,7 = 2835 \text{ W}$$

7) Άεργος ισχύς, Q

$$Q = \sqrt{S^2 - P^2}$$

$$\Rightarrow Q = \sqrt{4050^2 - 2835^2} = 2892 \text{ Var}$$