

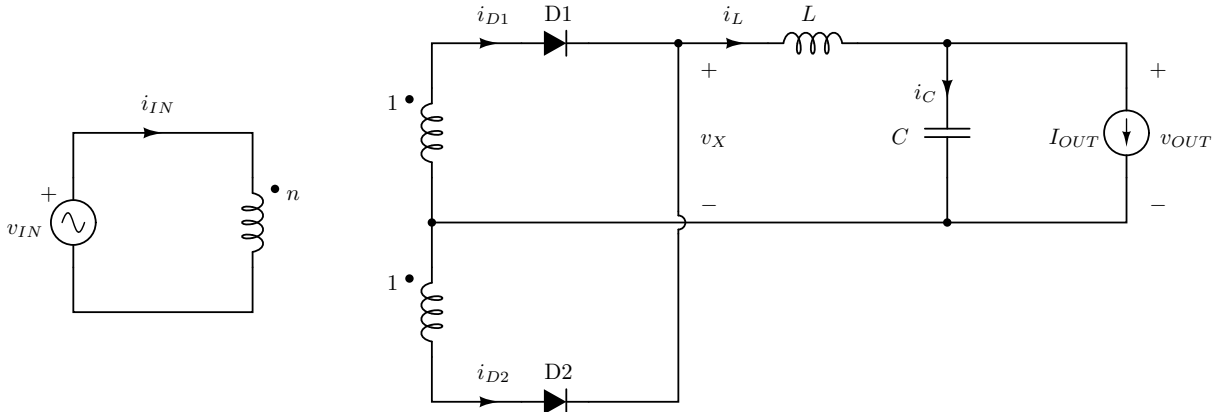
3. Ispravljač sa slike 3 ima $v_{IN} = 230\sqrt{2}V \sin(2\pi(50\text{Hz})t)$, $V_D = 1\text{V}$, $n = 34.512$, $L = 12.732\text{mH}$, $C = 15.915\text{mF}$, $I_{OUT} = 1\text{A}$. Smatrati $|\sin x| \approx \frac{2}{\pi} - \frac{4}{3\pi} \cos(2x)$ i da ispravljač radi u kontinualnom režimu provođenja.

a) [1] Odrediti srednju vrednost izlaznog napona $V_{OUT} = \overline{v_{OUT}}$.

b) [6] Odrediti vremenske dijagrame i_L , i_C , i_{D1} , i_{D2} , i_{IN} , v_X i $v_{out} = \hat{v}_{OUT} = v_{OUT} - V_{OUT}$. Dijagrame nacrtati jedan ispod drugog.

c) [2] Odrediti srednje snage disipacije na diodama D1 i D2, P_{D1} i P_{D2} .

d) [1] Odrediti koeficijent korisnog dejstva ispravljača.



Slika 3.

a) [1]

$$V_{OUT} = \frac{2}{\pi} \frac{V_m}{n} - V_D = \frac{2}{\pi} \frac{230\sqrt{2}V}{34.512} - 1V = 5V$$

b) [6] Slike su na sledećoj strani. Rezultati:

$$i_L = I_{OUT} - \frac{4}{3\pi} \frac{V_m}{n} \frac{1}{2\omega L} \sin(\omega t)$$

$$i_L = (1 - 0.5 \sin(\omega t)) \text{ A}$$

$$i_C = -\frac{4}{3\pi} \frac{V_m}{n} \frac{1}{2\omega L} \sin(\omega t)$$

$$i_C = -0.5 \sin(\omega t) \text{ A}$$

$$i_{D1} = i_L \times h(v_{IN})$$

$$i_{D1} = (1 - 0.5 \sin(\omega t)) \times h(\sin(\omega t)) \text{ A}$$

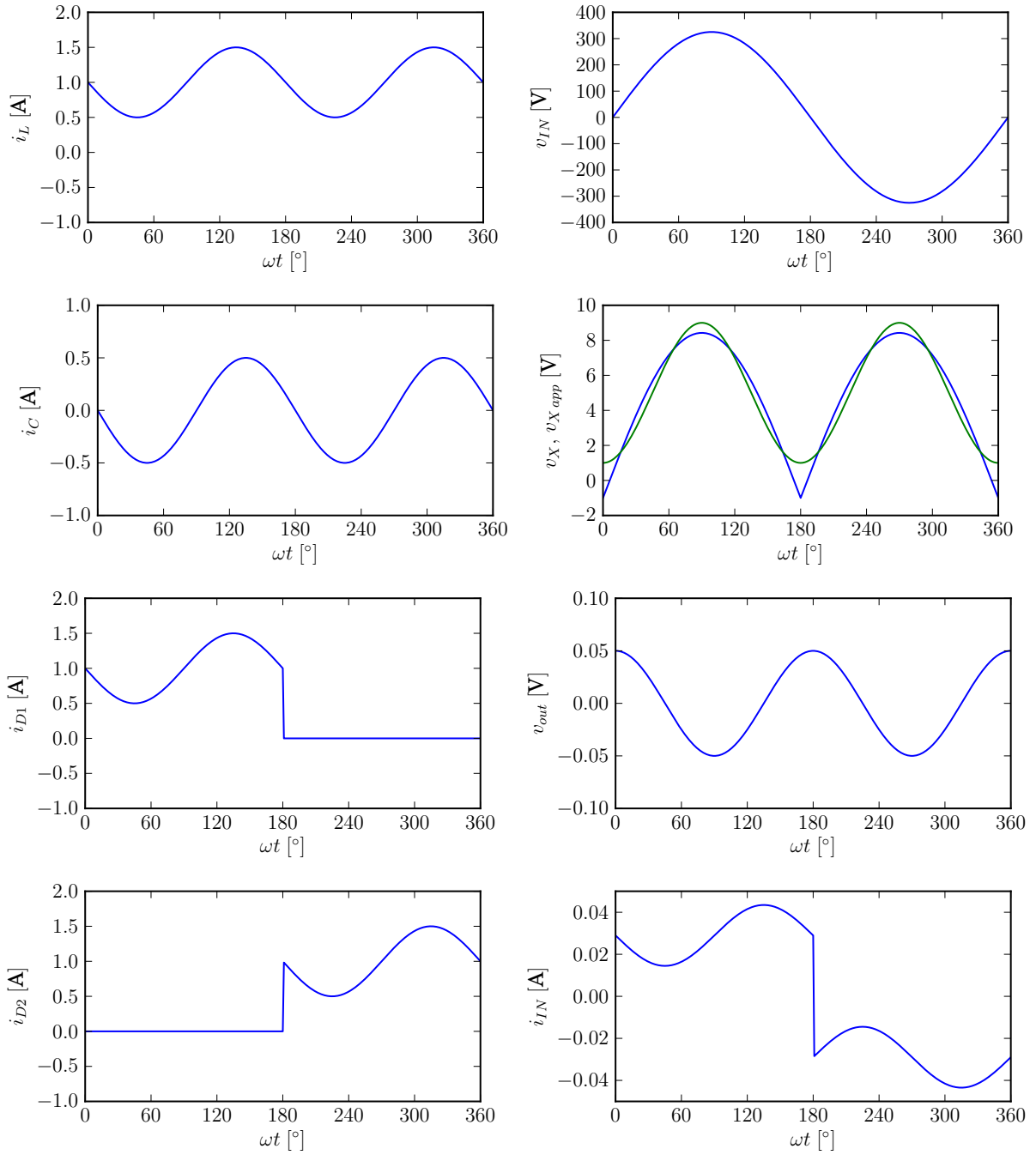
$$i_{D2} = i_L \times h(-v_{IN})$$

$$i_{D2} = (1 - 0.5 \sin(\omega t)) \times h(-\sin(\omega t)) \text{ A}$$

$$i_{IN} = \frac{1}{n} i_L \operatorname{sgn}(v_{IN})$$

$$i_{IN} = \frac{1}{34.512} (1 - 0.5 \sin(\omega t)) \times \operatorname{sgn}(\sin(\omega t)) \text{ A}$$

$$v_{out} = \hat{v}_{OUT} = \frac{4}{3\pi} \frac{V_m}{n} \frac{1}{2\omega L} \frac{1}{2\omega C} \cos(\omega t) = \frac{V_m}{3\pi n \omega^2 LC} \cos(\omega t)$$



$$v_{out} = \hat{v}_{OUT} = 50 \cos(\omega t) \text{ mV}$$

$$v_X = \frac{V_m}{n} |\sin(\omega t)| - V_D$$

$$v_X = (9.4248 |\sin(\omega t)| - 1) \text{ V}$$

c) [2]

$$P_{D1} = P_{D2} = \frac{1}{2} I_{OUT} V_D = 0.5 \text{ W}$$

d) [1]

$$\eta = \frac{P_{OUT}}{P_{OUT} + P_{D1} + P_{D2}} = \frac{5}{6} \approx 83.33\%$$