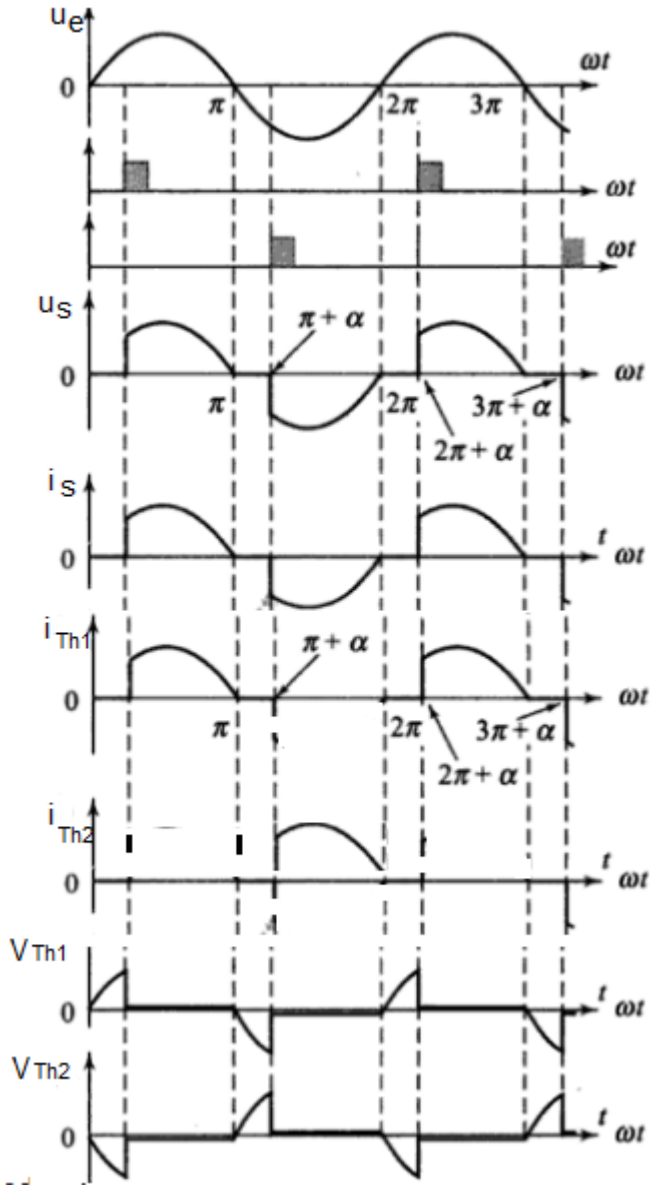
Corrigé TD6

Exercice 1

Charge résistive

1. **Forme d'ondes**



2. **Valeur efficace de la tension de charge**

$$V_{seff} = V_{eeff}\sqrt{1-\frac{\alpha}{\pi}+\frac{\sin 2\alpha}{2\pi}} = 230\sqrt{1-\frac{\frac{\pi}{4}}{\pi}+\frac{\sin 2\frac{\pi}{4}}{2\pi}} = 230\sqrt{1-\frac{1}{4}+\frac{1}{2\pi}} = 219V$$

3. **Facteur de puissance**

$$k = \frac{P_s}{S} = \sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin 2\alpha}{2\pi}} = 0.95$$

Ou bien :

$$k = \frac{P_s}{S}$$

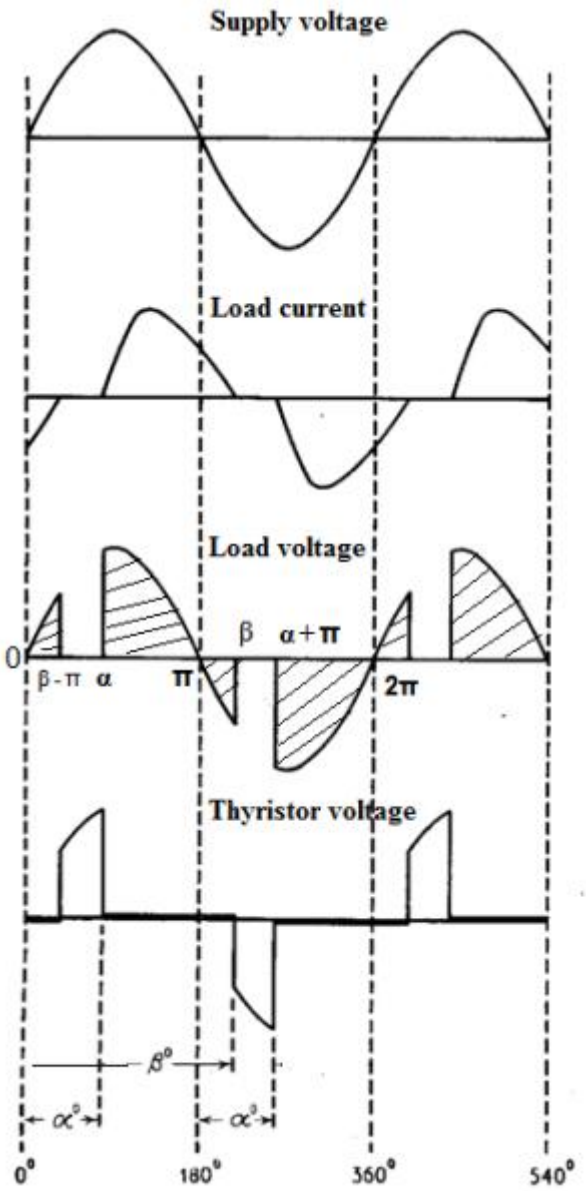
$$P_s = \frac{V_{seff}^2}{R} = \frac{219^2}{10} = 4796w \simeq 4.8kw$$

$$S = V_{eeff} I_{seff} = V_{eeff} \frac{V_{seff}}{R} = 230 \frac{219}{10} = 5037V.A$$

$$k = \frac{4796}{5037} = 0.95$$

Charge RL

1. **Forme d'ondes**



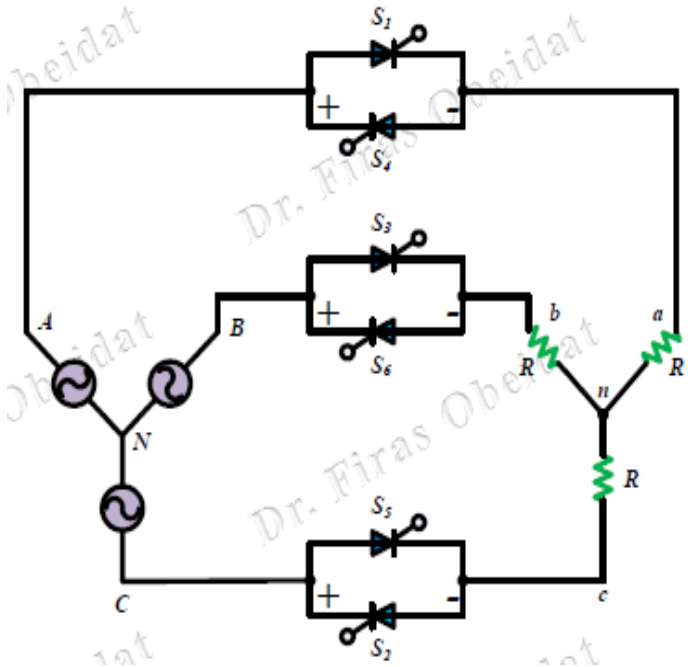
$$i_s(\omega t)=\begin{cases}\dfrac{V_{e\max}}{Z}\left(\sin(\varphi-\alpha)e^{\frac{-(\omega t-\alpha)}{\tan\varphi}}+\sin(\omega t-\varphi)\right) & \alpha<\omega t<\beta\\ -\dfrac{V_{e\max}}{Z}\left(\sin(\varphi-\alpha)e^{\frac{-(\omega t-\alpha)}{\tan\varphi}}+\sin(\omega t-\varphi)\right) & \pi+\alpha<\omega t<\beta\\ 0 & \beta<\omega t<\pi+\alpha\end{cases}$$

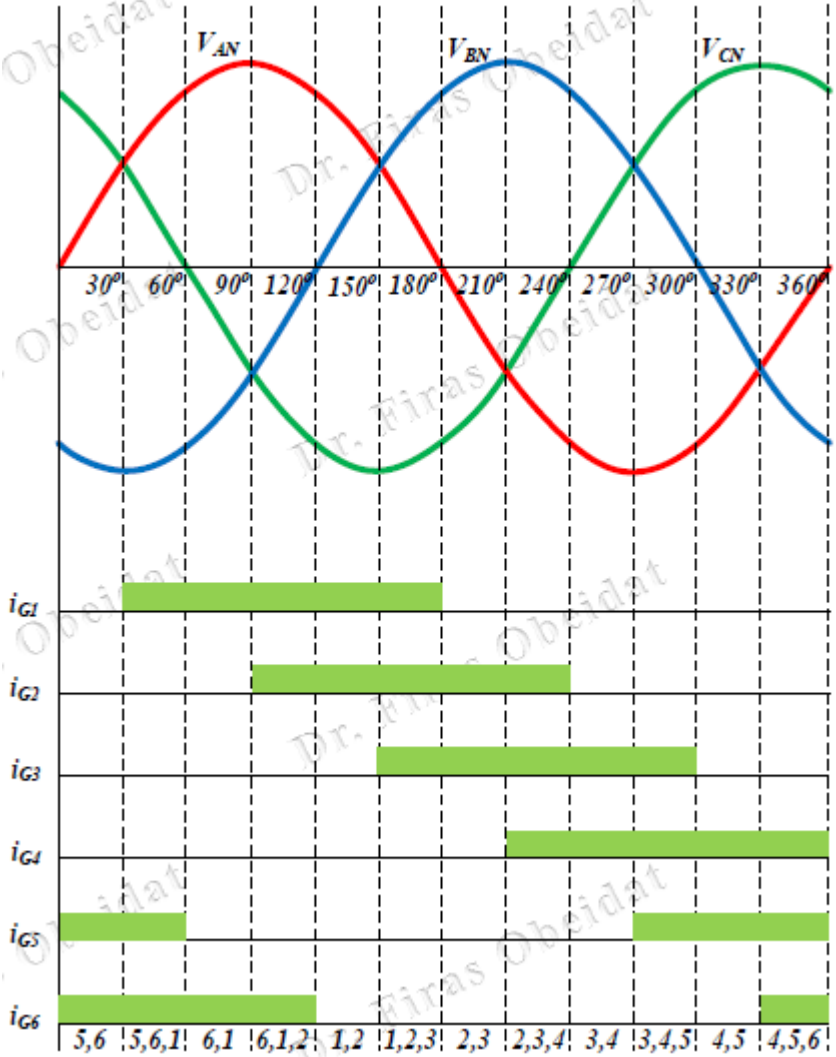
2. Valeur efficace de la tension de charge

$$V_{seff}=V_{max}\sqrt{\frac{1}{2\pi}(\beta-\alpha)+\frac{\sin 2\alpha}{4\pi}-\frac{\sin 2\beta}{4\pi}}$$

Exercice 2

1. Séquences de conduction des thyristors en mode 1





2. Facteur de puissance

$$k = \frac{P_s}{S}$$

$$P_s = 3\frac{V_{aneff}^2}{R}$$

$$V_{an} = \sqrt{3}V_{\max}\sqrt{\frac{1}{\pi}\left(\frac{\pi}{6} - \frac{\alpha}{4} + \frac{\sin 2\alpha}{8}\right)} = \sqrt{3}\frac{230}{\sqrt{2}}\sqrt{\frac{1}{\pi}\left(\frac{\pi}{6} - \frac{\frac{\pi}{6}}{4} + \frac{\sin 2\frac{\pi}{6}}{8}\right)} = 225V$$

$$P_s = 3\frac{V_{aneff}^2}{R} = 3\frac{225^2}{15} = 10125W \simeq 10.125kW$$

$$S = 3V_{eeff}I_{seff} = 3V_{eeff}\frac{V_{seff}}{R} = 3\times 230\frac{225}{15} = 10350V.A$$

$$k = \frac{10125}{10350} = 0.98$$