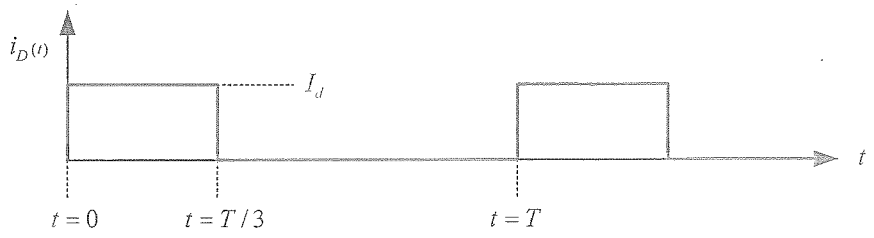
Peer assessment #3 in Power Electronics, *version A*

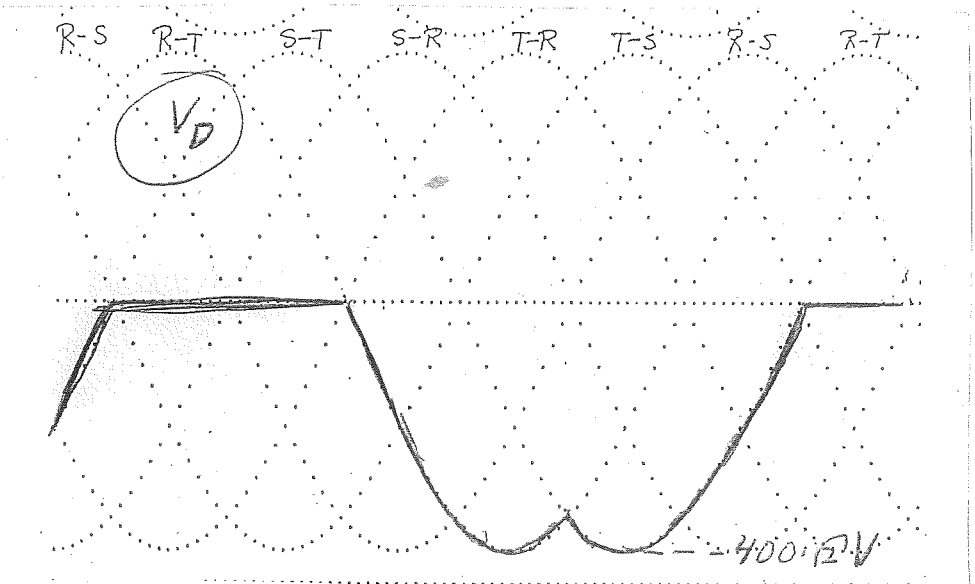
A three-phase diode bridge rectifier has a totally smooth output current I_d. The waveform of the current through a diode is shown in the figure below.



1. Determine the mean value of $i_D(t)$.

$$I_D = \frac{1}{T}\int_0^T i_D(t)\,dt = \frac{I_d}{T}\int_0^{T/3} dt = \frac{I_d}{3}$$

2. Draw the voltage across one of the diodes during one cycle.

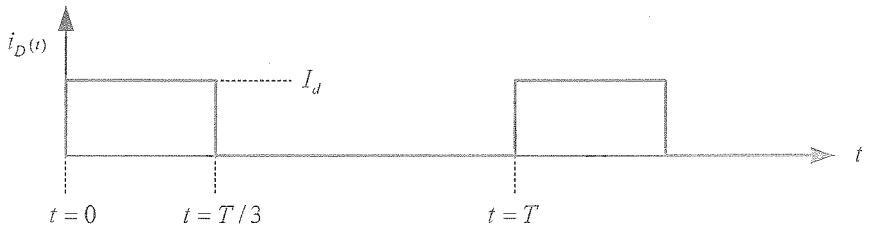


3. The same rectifier feeds a load consisting of a voltage source E in series with a resistance R and a large inductance. Calculate I_d if the line-to-line voltage of the grid is 400 V, $E = 400$ V and $R = 14\ \Omega$.

$$I_d = \frac{V_d - E}{R} = \frac{1{,}35 \cdot 400 - 400}{14} = 10\ \text{A}$$

Peer assessment #3 in Power Electronics, *version B*

A three-phase diode bridge rectifier has a totally smooth output current I_d. The waveform of the current through a diode is shown in the figure below.



1. Determine the RMS value of $i_D(t)$.

$$I_{DRMS} = \sqrt{\frac{1}{T}\int_0^T [i_D(t)]^2 dt} = \sqrt{\frac{I_d^2}{T}\int_0^{T/3} dt} =$$

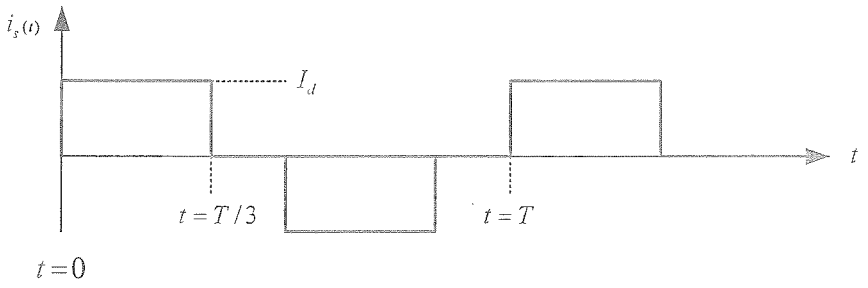
$$= \sqrt{\frac{I_d^2}{3}} = \frac{I_d}{\sqrt{3}}$$

2. The same rectifier feeds a load consisting of a voltage source E in series with a resistance R and an inductance. Calculate I_d if the line-to-line voltage of the grid is 200 V, $E = 200$ V and $R = 7\ \Omega$.

$$I_d = \frac{V_d - E}{R} = \frac{1{,}35 \cdot 200 - 200}{7} = 10\ A$$

Peer assessment #3 in Power Electronics, *version C*

A three-phase diode bridge rectifier has a totally smooth output current I_d. The waveform of one of the grid currents is shown in the figure below.



1. Determine the RMS value of $i_s(t)$.

$$I_{SRMS} = \sqrt{\frac{1}{T}\int_0^T [i_s(t)]^2 dt} = \sqrt{\frac{1}{T}\left(\int_0^{T/3} I_d^2\, dt + \int_0^{T/3} (-I_d)^2 dt\right)} =$$

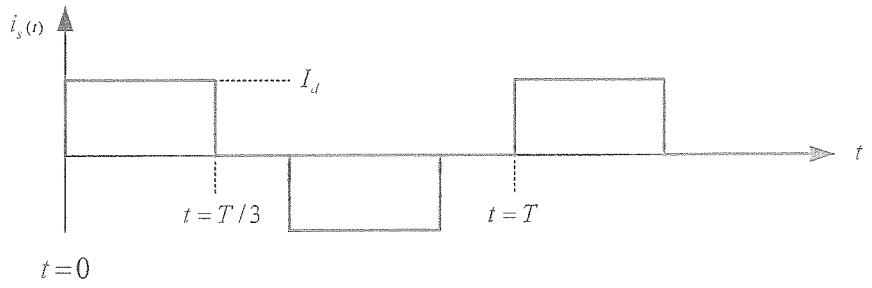
$$= \sqrt{\frac{1}{T}\left(I_d^2 \cdot \frac{T}{3} + I_d^2 \cdot \frac{T}{3}\right)} = \sqrt{I_d^2 \cdot \frac{2}{3}} = \sqrt{\frac{2}{3}}\, I_d$$

2. The same rectifier feeds a load consisting of a voltage source E in series with a resistance R and an inductance. Calculate I_d if the line-to-line voltage of the grid is 300 V, $E = 300$ V and $R = 10{,}5\ \Omega$.

$$I_d = \frac{V_d - E}{R} = \frac{1{,}35 \cdot 300 - 300}{10{,}5} = 10\ \text{A}$$

Peer assessment #3 in Power Electronics, *version D*

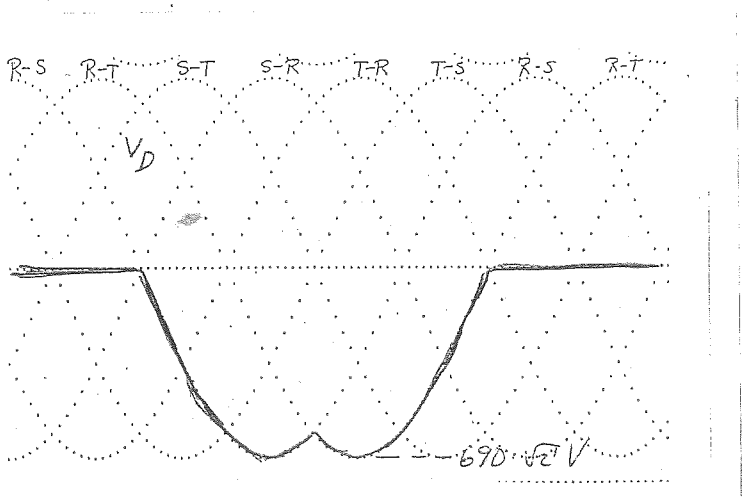
A three-phase diode bridge rectifier has a totally smooth output current I_d. The waveform of one of the grid currents is shown in the figure below.



1. Determine the mean value of $i_s(t)$.

0

2. Draw the voltage across one of the diodes during one cycle.



3. The same rectifier feeds a load consisting of a voltage source E in series with a resistance R and an inductance. Calculate I_d if the line-to-line voltage of the grid is 690 V, $E = 690$ V and $R = 24{,}15\ \Omega$.

$$I_d = \frac{V_d - E}{R} = \frac{1{,}35 \cdot 690 - 690}{24{,}15} = 10\ A$$