Power Electronics Lab

three phase
controlled rectifier

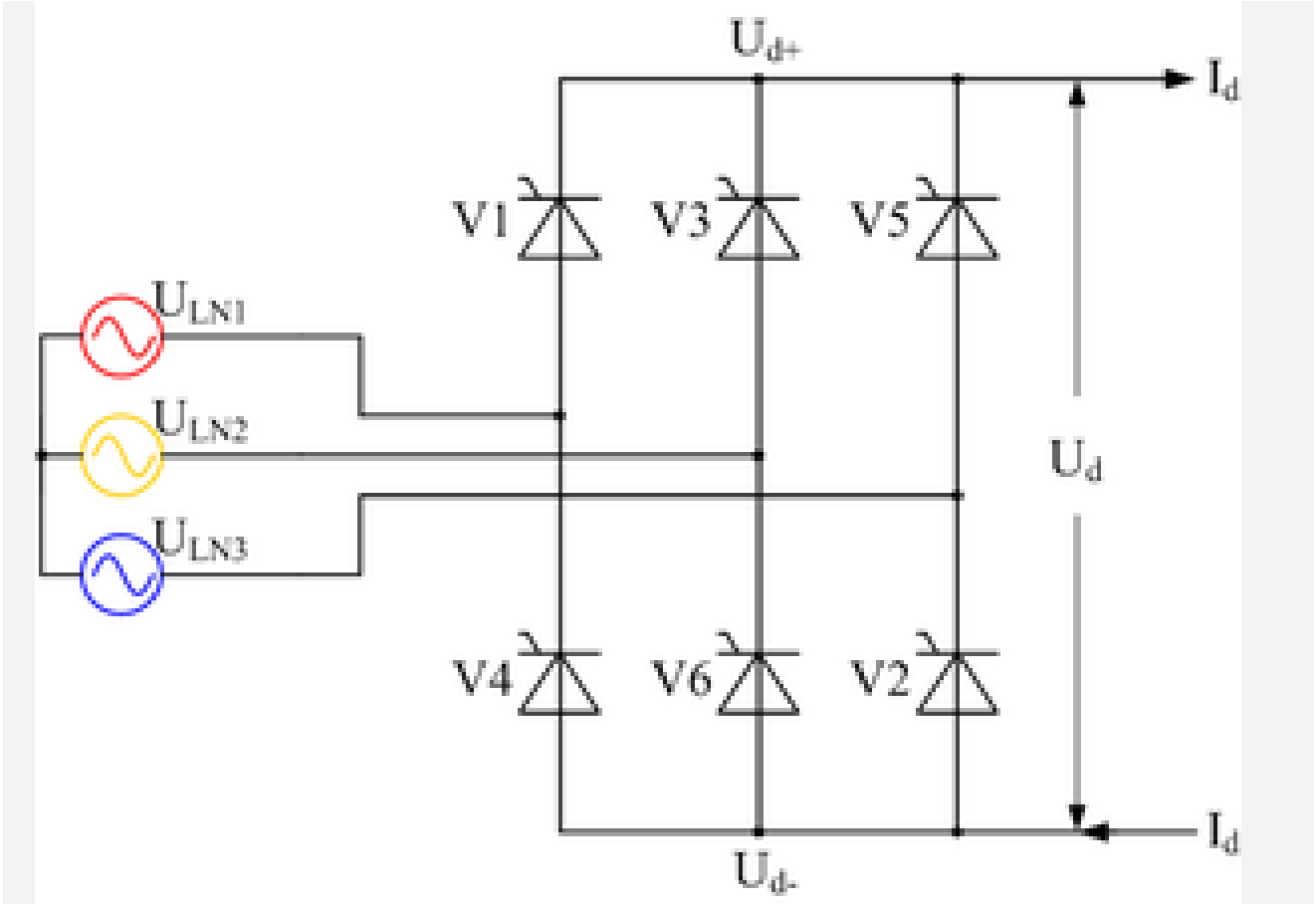
Eng :Eman Abu Hany

Three Phase controlled Rectifier

1- the controlled three - pulse Mid – point circuit M3C

2- the controlled six - pulse Bridge Circuit B6C

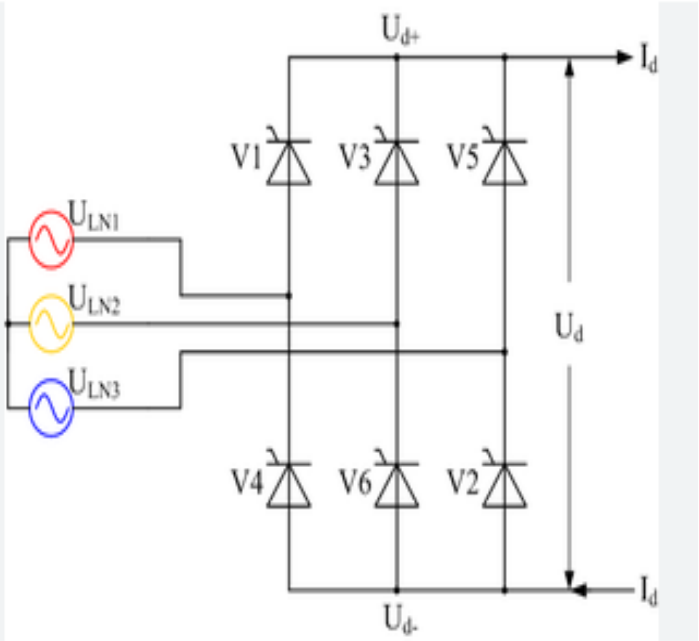
the controlled six - pulse Bridge Circuit B6C

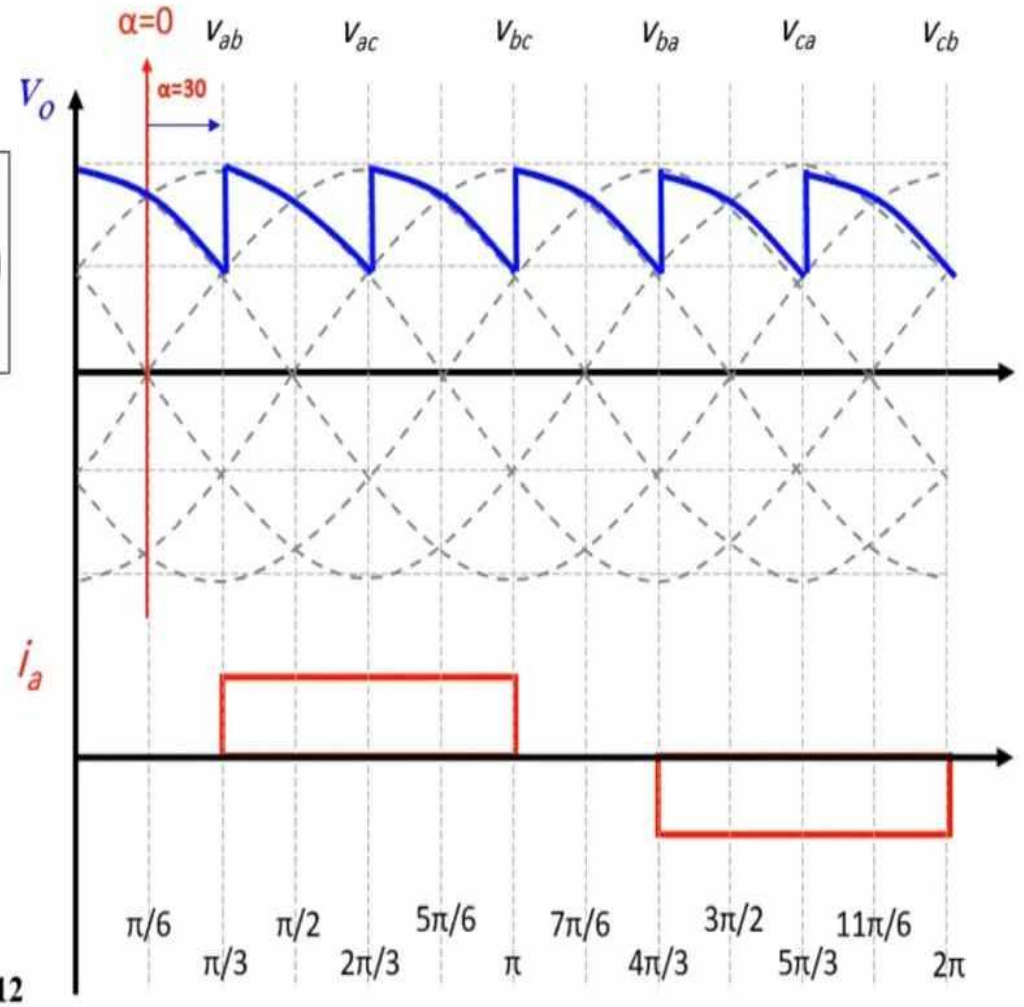


Output voltage of controlled Rectifier

RL load

$$v_{avg} = \frac{3}{\pi}\int_{\pi/3+\alpha}^{2\pi/3+\alpha} V_{mL}\sin(\omega t)\,d\omega t = \frac{3V_{mL}}{\pi}\cos(\alpha)$$





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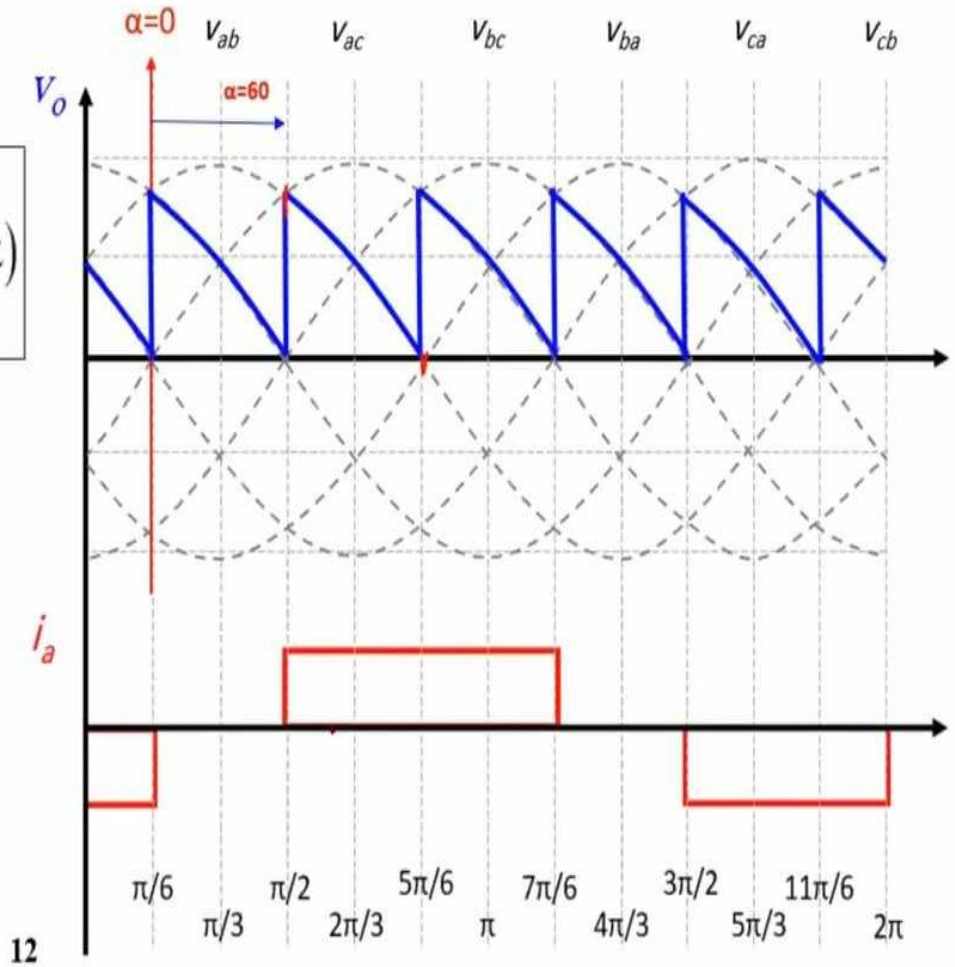

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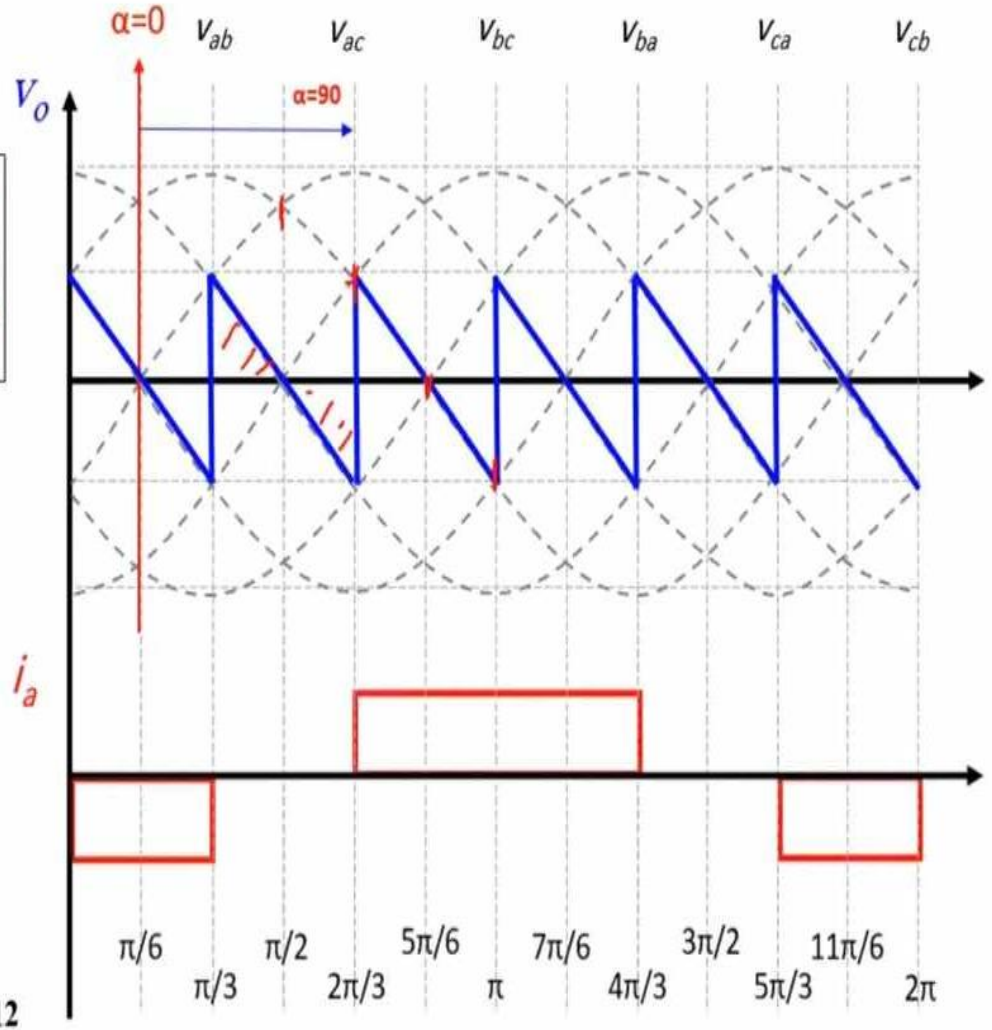

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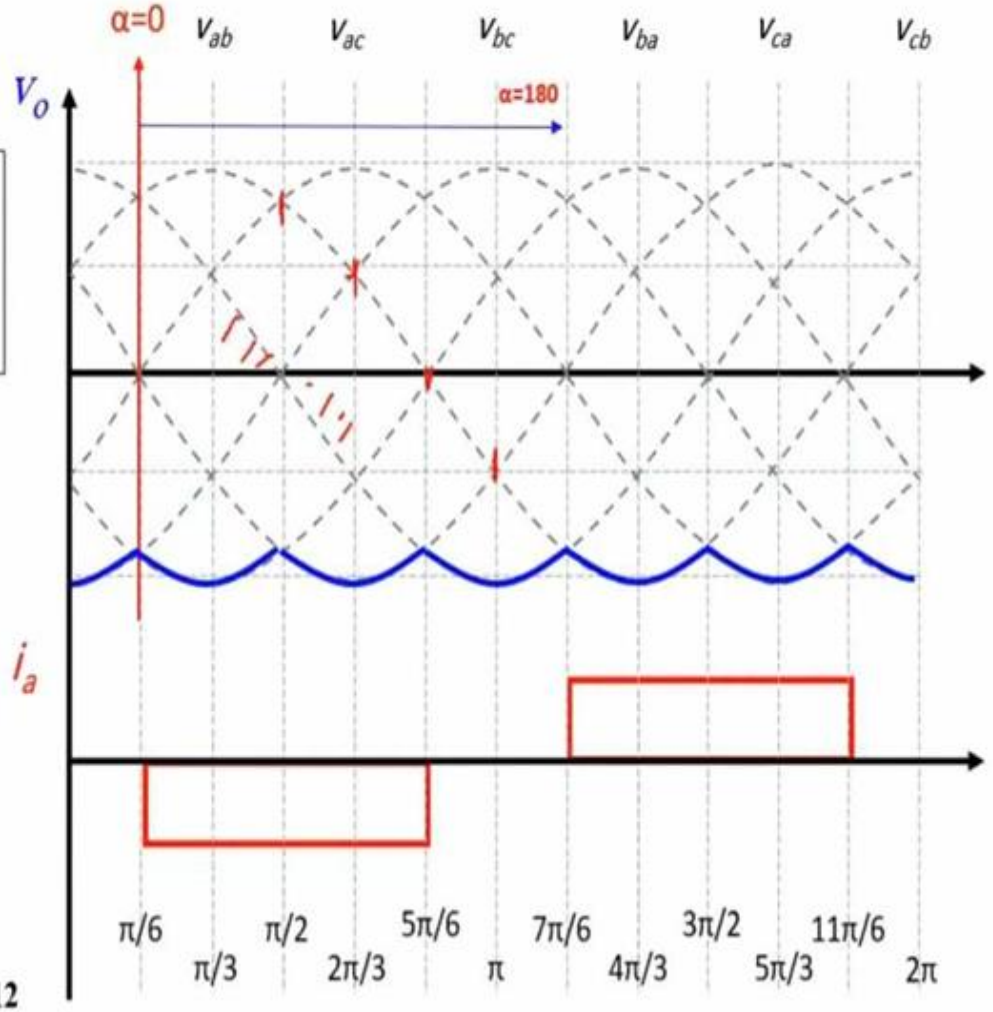
$$0 \le \alpha \le 180$$

$$V_{avg} = +ve \quad \alpha < 90$$

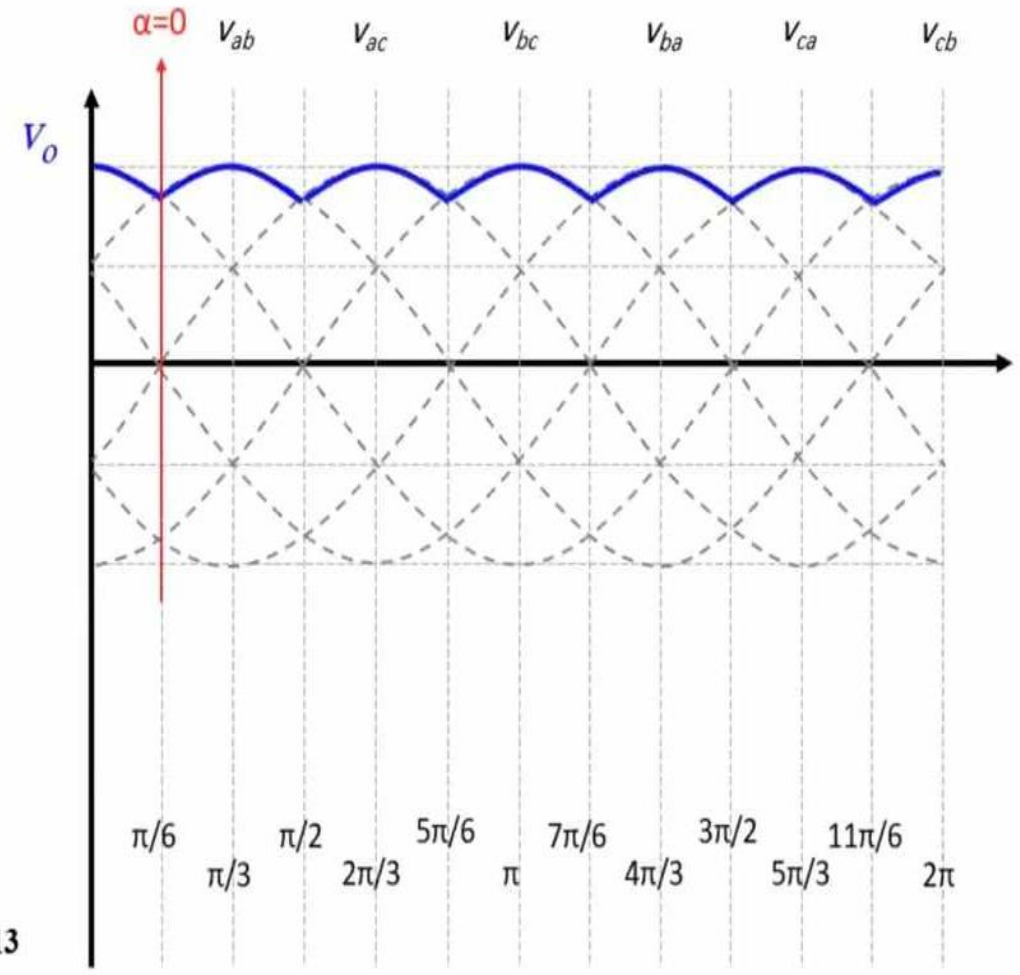
$$V_{avg} = zero \quad \alpha = 90$$

$$V_{avg} = -ve \quad \alpha > 90$$



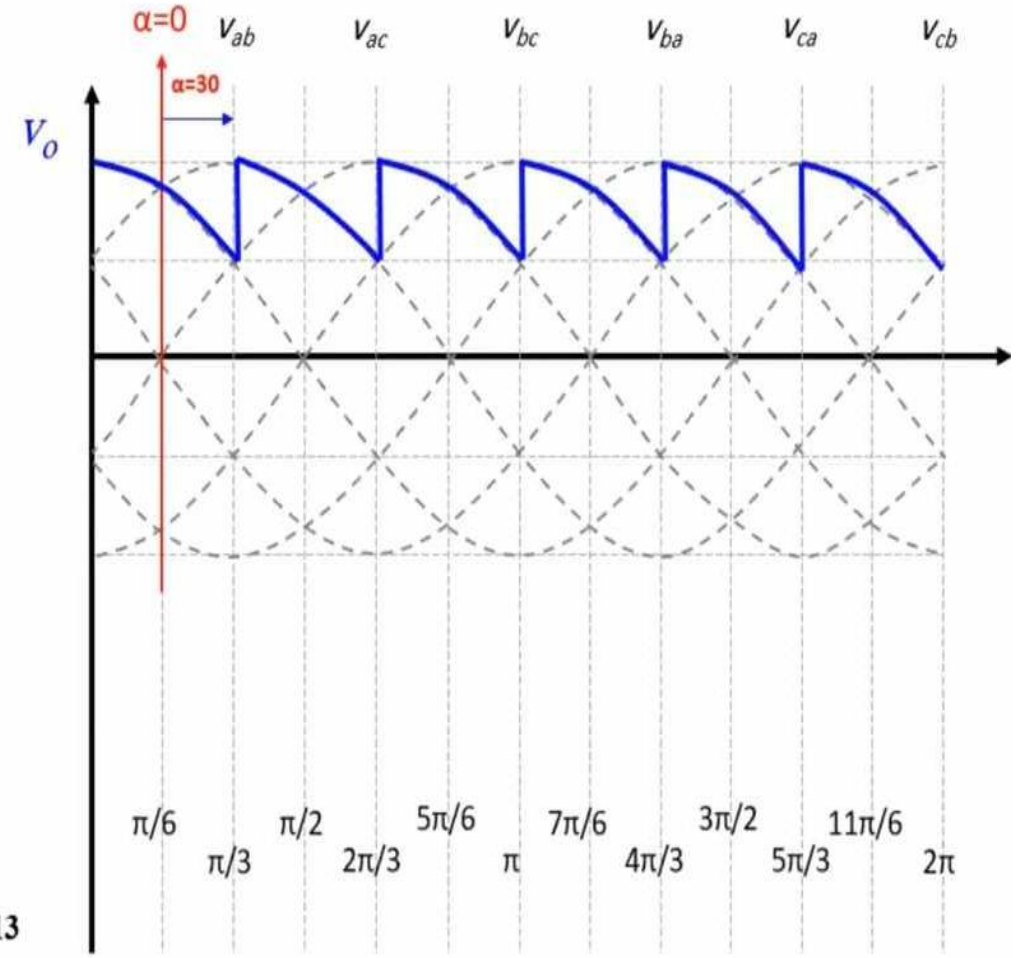
Output voltage of controlled Rectifier

R load



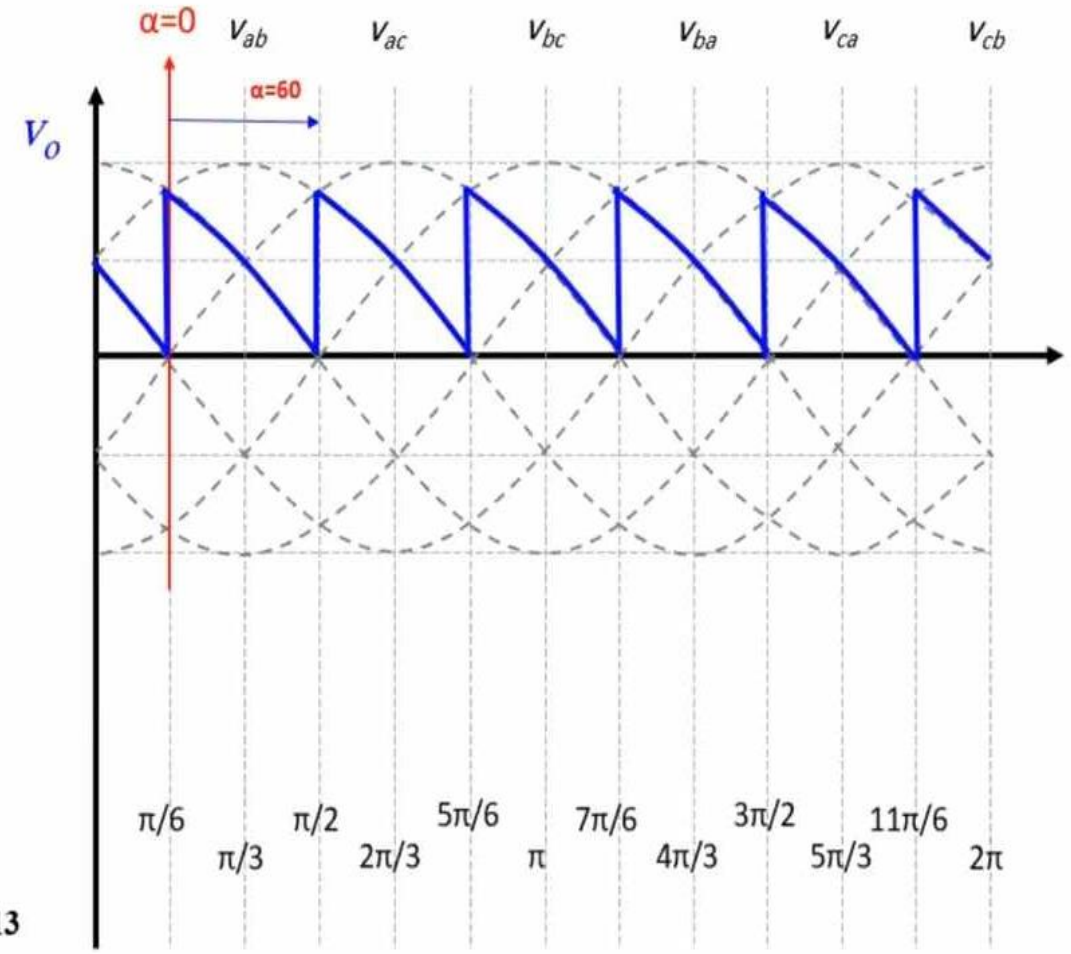
Output voltage of controlled Rectifier

R load



Output voltage of controlled Rectifier

R load

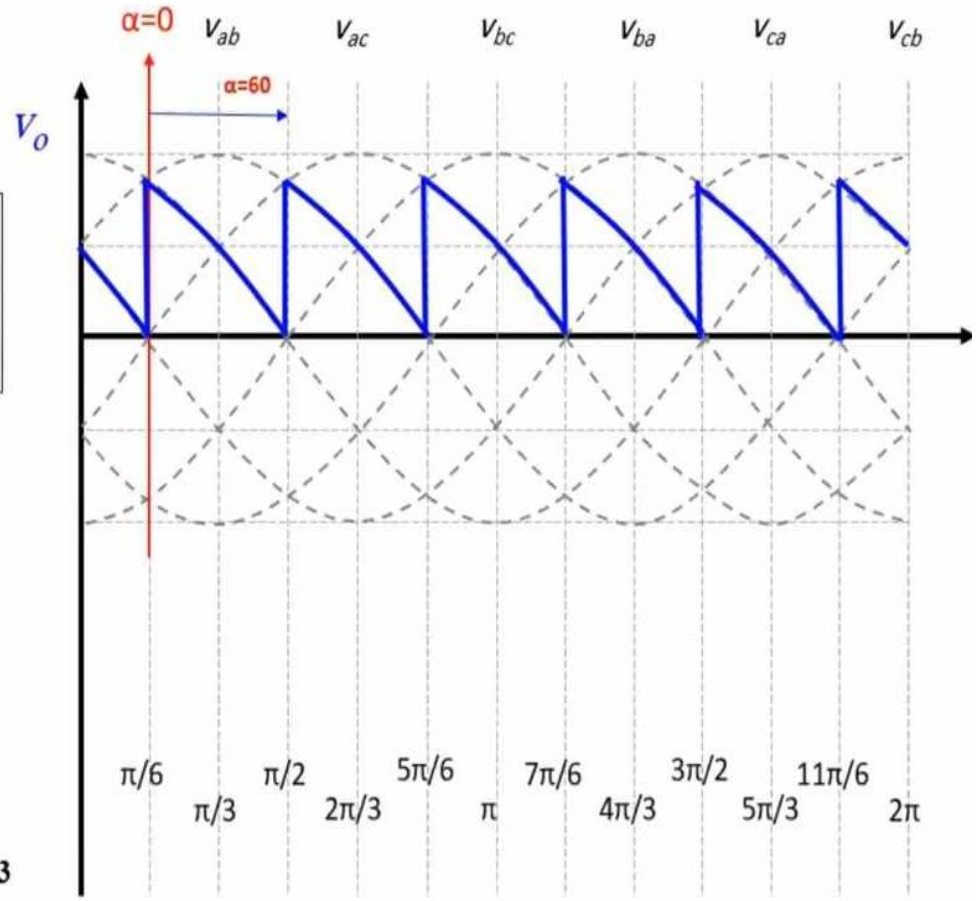


Output voltage of controlled Rectifier

R load

$$0 \le \alpha \le 60$$

$$v_{avg} = \frac{3}{\pi}\int_{\pi/6+\alpha}^{2\pi/3+\alpha} V_{mL}\sin(\omega t)\,d\omega t = \frac{3V_{mL}}{\pi}\cos(\alpha)$$



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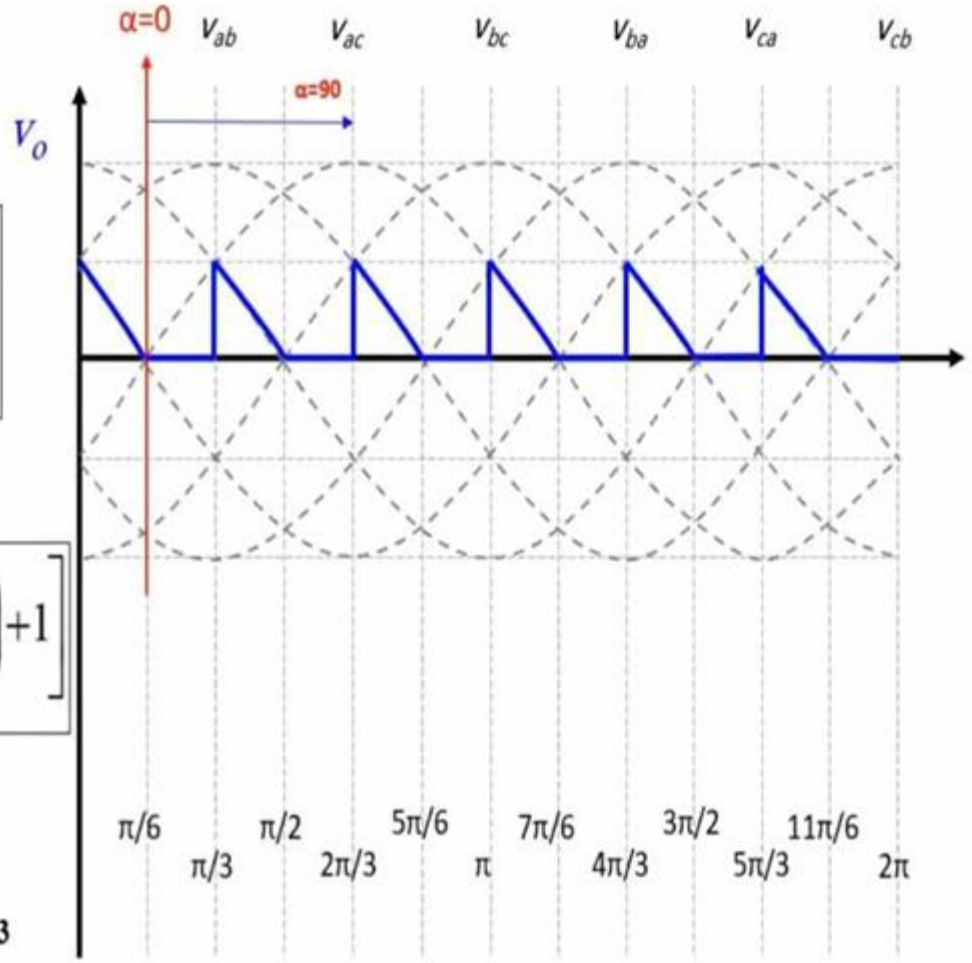
$$60 \le \alpha < 120$$

$$v_{avg} = \frac{3}{\pi}\int_{\pi/6+\alpha}^{\pi} V_{mL}\sin(\omega t)\,d\omega t = \frac{3V_{mL}}{\pi}\left[\cos\left(\frac{\pi}{6}+\alpha\right)+1\right]$$



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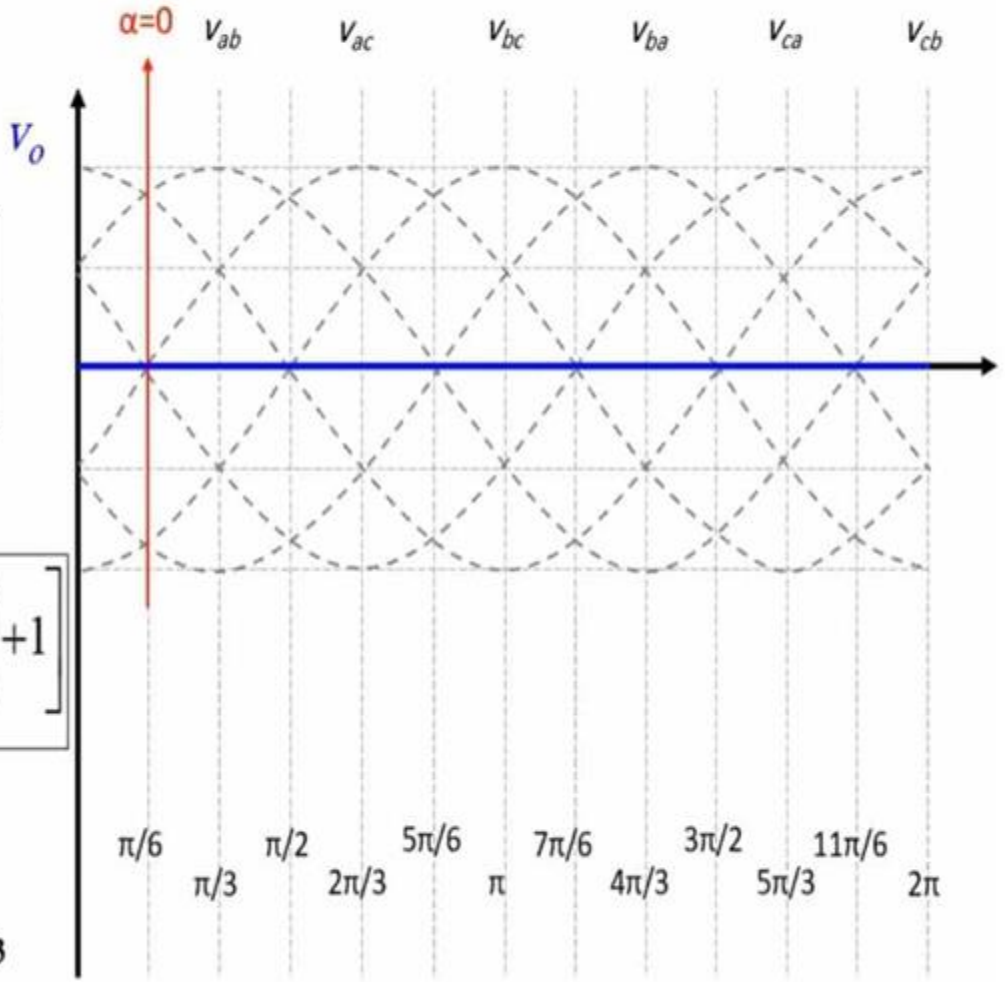
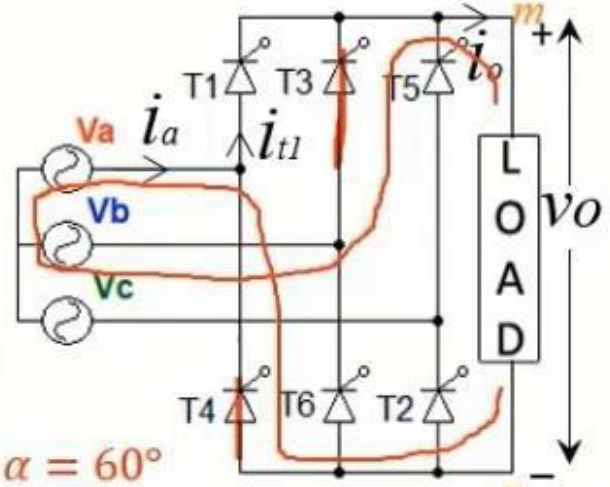
$$0 \le \alpha < 120$$

$$V_{avg} = +ve \quad \alpha < 120$$



3 phase full wave controlled rectifier

$0° \le \alpha \le 60°$



$\alpha = 60°$

$\omega t = 90°$ *to* $150°$, T1 and T6 conduct

$v_o = v_{ab}$

$\omega t = 150°$ *to* $210°$, T1 and T2 conduct

$v_o = v_{ac}$

$\omega t = 210°$ *to* $270°$, T2 and T3 conduct

$v_o = v_{bc}$

$\omega t = 270°$ *to* $330°$, T3 and T4 conduct

$v_o = v_{ba}$

$\omega t = 330°$ *to* $390°$, T4 and T5 conduct

$v_o = v_{ca}$

$\omega t = 390°$ *to* $450°$ T5 and T6 conduct

A Karmaka $vo = vcb$