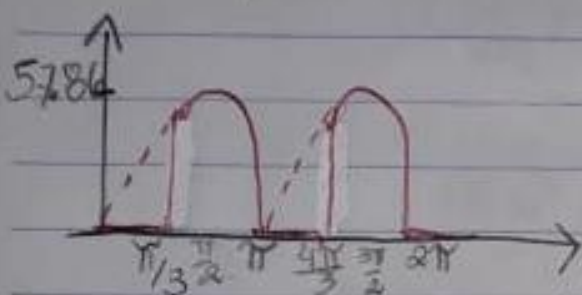


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P1

1. Retificador Monofásico Controlado

(a) forma de onda da tensão na carga, para ângulo de disparo de 60° .



$$\frac{579.6}{3} - 2 = 57.86$$

(b) $V_{\text{medio}}?$ $V_{\text{RMS}}?$ 60°

$$\begin{cases} V_{\text{medio carga}} = \left(\frac{V_{\text{pico}}}{\pi} \right) \cdot [1 + \cos(\alpha)] \\ V_{\text{RMS}} = \frac{V_{\text{pico}}}{\sqrt{2}} \cdot \left[1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi} \right] \end{cases} \quad 0.5$$

$$V_{\text{medio carga}} = \left(\frac{57.96}{\sqrt{2}} \right) \cdot [1 + \cos(2)]$$

$$V_{\text{medio carga}} = 27.62 \text{ V}$$

$$V_{\text{RMS}} = \left(\frac{57.86}{\sqrt{2}} \right) \cdot \left[1 - \left(\frac{\pi/2}{\pi} \right) + \frac{\sin(2\pi/2)}{2\pi} \right] \quad 0.5$$

$$V_{\text{RMS}} = \left(\frac{57.86}{\sqrt{2}} \right) \cdot \left(\frac{1}{\sqrt{2}} \right)$$

$$V_{\text{RMS}} = 36.7 \text{ V}$$

$$(c) P_{\text{CARGA}} = \frac{(V_{\text{RMS}})_{\text{CARGA}}^2}{R} = \frac{(36.7)^2}{30} = 44.89 \text{ W}$$

$$V_{RMS} = \sqrt{11E3}$$

$$V_{RMS} = 104.88$$

$$3. \quad P = \frac{V_{RMS}^2}{R} \rightarrow JIK = \frac{V_{RMS}^2}{1}$$

$$V_{RMS} = 11E3 \text{ V}$$

$$V_{RMS} = 127 \sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}}$$

$$11E3 = \left(127 \sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}} \right)^2$$

$$\frac{11E3}{127^2} = 1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}$$

$$0.682 = 1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}$$

$$0.682 - 1 = -\frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi} \quad \therefore -0.999 = -\frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}$$

$$0.999 = \frac{\alpha}{\pi} - \frac{\sin(2\alpha)}{2\pi}$$

$$a) \quad \alpha = 1.2767 \text{ RAD}$$

b) V_{RMS} encontrado anteriormente com valor de 104.88

$$4. \quad R = 10\Omega \quad 127 \cdot \sqrt{2} = 179.6$$

$$\alpha = 45^\circ \text{ e } 120^\circ$$

$$\alpha = \frac{2\pi}{3}$$

$$[120^\circ]$$

$$V_{\text{medio CARGA}} = \frac{3 V_{\text{fase MAX}}}{2\pi} \left[1 + \cos\left(\alpha + \frac{\pi}{6}\right) \right]$$

$$V_{\text{medio CARGA}} [120^\circ] = 11.48 \text{ V}$$

$$V_{RMS \text{ CARGA}} = \sqrt{3} \cdot V_{\text{fase MAX}} \left[\frac{5}{24} - \frac{\alpha}{4\pi} + \frac{1}{8\pi} \cdot \sin\left(\frac{\pi}{3} + 2\alpha\right) \right]$$

$$V_{RMS} [120^\circ] = 26.41 \text{ V}$$

$$[45^\circ]$$

$$P/30^\circ < \alpha < 150^\circ \quad \pi/4$$

$$V_{\text{medio}} = \frac{3 V_{\text{fase MAX}}}{2\pi} \left[1 + \cos\left(\alpha + \frac{\pi}{6}\right) \right]$$

$$V_{\text{medio carga}} = 107.95 \text{ V} \quad 1.26$$

$$V_{\text{RMS}} = \sqrt{3 \cdot V_{\text{fase MAX}} \left[\frac{5 - \alpha}{24} + \frac{1}{4\pi} + \frac{1}{8\pi} \cdot \frac{\sin(\frac{\pi}{6} + 2\alpha)}{3} \right]}$$

$$V_{\text{RMS}} = 126.463 \text{ V}$$

$$5. \quad 50^\circ - 25^\circ = 25^\circ \quad 20^\circ - 150 \text{ W}$$

$$25^\circ - X$$

$$X = 187.5 \text{ W}$$

$$P = \frac{V_{\text{RMS}}^2}{R} = 187.5 = \frac{V_{\text{RMS}}^2}{10} \rightarrow V_{\text{RMS}} = 43.3013 \text{ V}$$

$$V_{\text{RMS}} = \frac{V_p}{\sqrt{2}} \left[1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi} \right]$$

$$\rightarrow (43.301)^2 = (127 \cdot \left[1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi} \right])^2$$

$$\frac{1875}{127^2} = 1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}$$

$$\rightarrow 2.77 = \alpha - 0.5 \sin(2\alpha)$$

$$\alpha = 2.28 \text{ RAD} \rightarrow 130.7^\circ$$

2a)

$$V_{med} = \left(\frac{3 \cdot 220 \cdot \sqrt{2}}{\pi} \right) \cdot \cos\left(\frac{\pi}{6}\right)$$

$$V_{med} = 257.29 \text{ V}$$

b)

$$V_{BR} = V_{rrm} \geq \sqrt{2} \cdot 220 \text{ V}$$

$$V_{RRM} \geq 311 \text{ V}$$

$$I_{media} = \left(\frac{3 \cdot 220 \sqrt{2}}{\pi R} \right) \cos(\alpha)$$

$$I_m = 25.73$$

Corrente em cada SCR = $\frac{25.73}{3} = 8.4 \text{ A}$

REV