

Chapter 1 - Introduction

Problem 1.1

$$\pi := 4 \operatorname{atan}(1)$$

$$\pi = 3.142$$

$$I_p := 100$$

$$T_o := 8.3 \cdot 10^{-3}$$

$$T := 16.67 \cdot 10^{-3}$$

$$I_{\text{RMS}} := \frac{I_p}{\sqrt{2}}$$

$$I_{\text{RMS}} = 70.711$$

$$I_{\text{AVG}} := 2 \cdot \frac{I_p}{\pi}$$

$$I_{\text{AVG}} = 63.662$$

Problem 1.2

$$I_p := 100$$

$$k := 0.5$$

$$T := 16.67 \cdot 10^{-3}$$

$$I_{\text{RMS}} := I_p \cdot \sqrt{\frac{k}{2}}$$

$$I_{\text{RMS}} = 50$$

$$I_{\text{AVG}} := \frac{I_p}{\pi}$$

$$I_{\text{AVG}} = 31.831$$

$$t_1 := 0$$

$$t_1 = 0$$

$$t_2 := \frac{T}{2}$$

$$t_2 = 8.335 \times 10^{-3}$$

$$T_o := k \cdot T$$

$$T_o = 8.335 \times 10^{-3}$$

$$\theta_1 := 2 \cdot \pi \cdot \frac{t_1}{T}$$

$$\theta_1 = 0$$

$$\theta_2 := 2 \cdot \pi \cdot \frac{t_2}{T}$$

$$\theta_2 = 3.142$$

$$I_{\text{AVG}} := \frac{I_p}{2 \cdot \pi} \cdot \int_{\theta_1}^{\theta_2} \sin(x) \, dx$$

$$I_{\text{AVG}} = 31.831$$

Problem 1.3

$$\begin{aligned}
 I_p &:= 100 & k &:= 0.8 & T &:= 16.67 \cdot 10^{-3} \\
 t_1 &:= T \cdot (1 - k) & & & t_1 &= 3.334 \times 10^{-3} \\
 t_2 &:= \frac{T}{2} & & & t_2 &= 8.335 \times 10^{-3} \\
 T_o &:= k \cdot T & & & T_o &= 0.013 \\
 I_{\text{RMS}} &:= I_p \cdot \sqrt{\frac{k}{2} + \frac{\sin[T_o \cdot (1 - k)] \cos[\pi \cdot (1 - k)]}{2 \cdot \pi}} & & & I_{\text{RMS}} &= 63.273 \\
 \theta_1 &:= 2 \cdot \pi \cdot \frac{t_1}{T} & & & \theta_1 &= 1.257 \\
 \theta_2 &:= 2 \cdot \pi \cdot \frac{t_2}{T} & & & \theta_2 &= 3.142 \\
 I_{\text{AVG}} &:= \frac{I_p}{2 \cdot \pi} \cdot \int_{\theta_1}^{\theta_2} \sin(x) \, dx & & & I_{\text{AVG}} &= 20.834
 \end{aligned}$$

Problem 1.4

$$\begin{aligned}
 I_p &:= 100 & k &:= 0.4 & T &:= 1 \cdot 10^{-3} \\
 T_o &:= k \cdot T & & & T_o &= 4 \times 10^{-4} \\
 I_{\text{RMS}} &:= I_p \cdot \sqrt{k} & & & I_{\text{RMS}} &= 63.246 \\
 I_{\text{AVG}} &:= I_p \cdot k & & & I_{\text{AVG}} &= 40
 \end{aligned}$$

Problem 1.5

$$\begin{aligned}
 I_a &:= 80 & I_b &:= 100 & k &:= 0.4 & T &:= 1 \cdot 10^{-3} \\
 T_o &:= k \cdot T & & & & & T_o &= 4 \times 10^{-4}
 \end{aligned}$$

$$I_{\text{RMS}} := \sqrt{k \cdot \frac{(I_b^2 + I_a \cdot I_b + I_a^2)}{3}} \quad I_{\text{RMS}} = 57.038$$

$$I_{\text{AVG}} := k \cdot I_a + \frac{\frac{1}{2} \cdot k \cdot T \cdot (I_b - I_a)}{T} \quad I_{\text{AVG}} = 36$$

Problem 1.6

$$I_p := 100 \quad k := 0.4 \quad T := 1 \cdot 10^{-3}$$

$$T_o := k \cdot T \quad T_o = 4 \times 10^{-4}$$

$$I_{\text{RMS}} := I_p \sqrt{\frac{k}{3}} \quad I_{\text{RMS}} = 36.515$$

$$I_{\text{AVG}} := \frac{\frac{1}{2} \cdot k \cdot T \cdot I_p}{T} \quad I_{\text{AVG}} = 20$$