Berejnec Adrian - Daniel

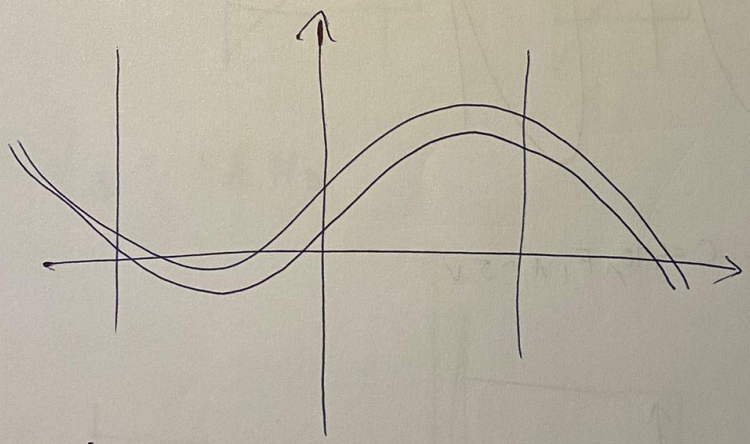
1.1

Aplicația 2 CD

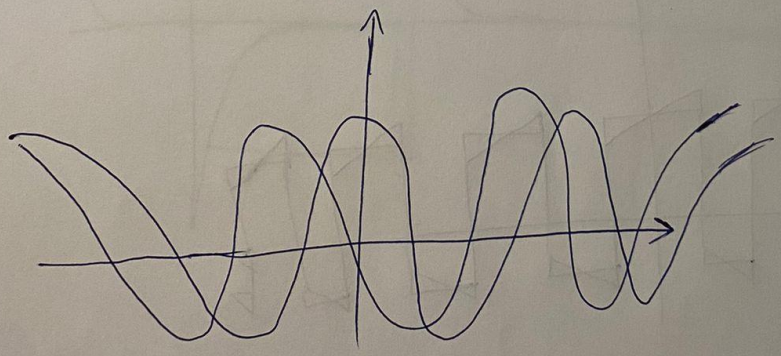
- **Diagrame de timp:**

3.1.1. a) $R = 12\,k\Omega$, $C = 470\,nF$, $A = 5\,V$

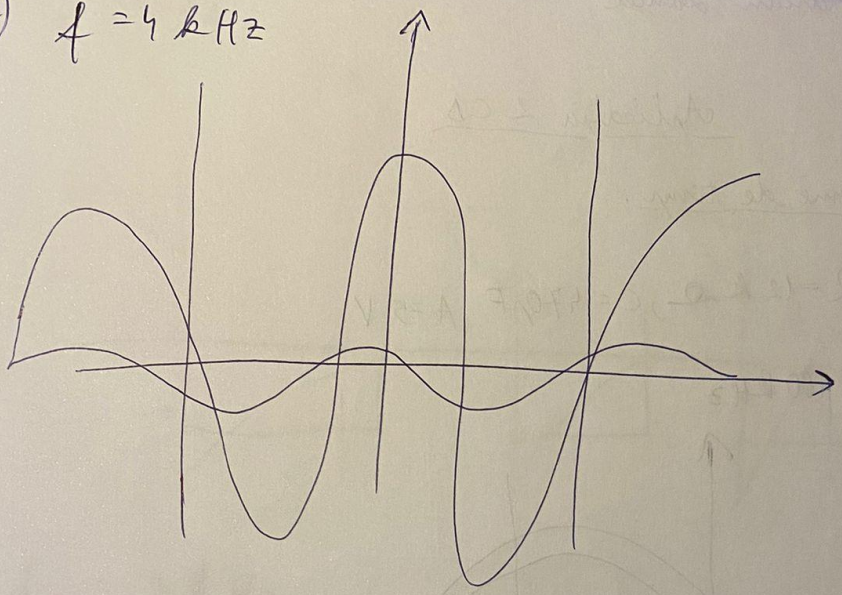
a) $f_1 = 400\,kHz$



b) $f_2 = 40\,kHz$

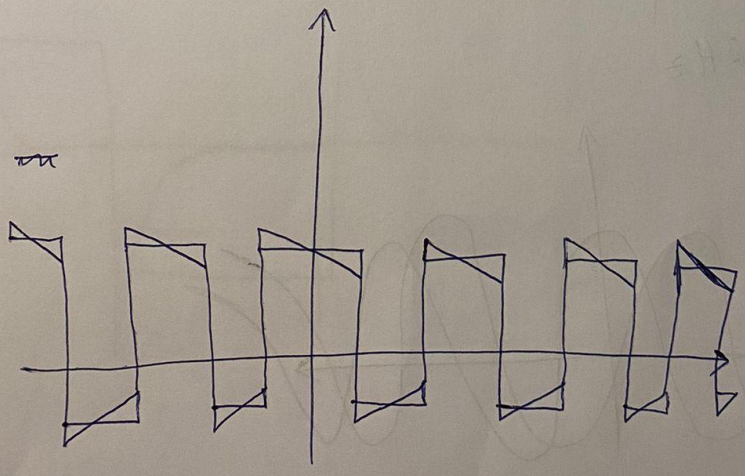


c) $f = 4\,kHz$

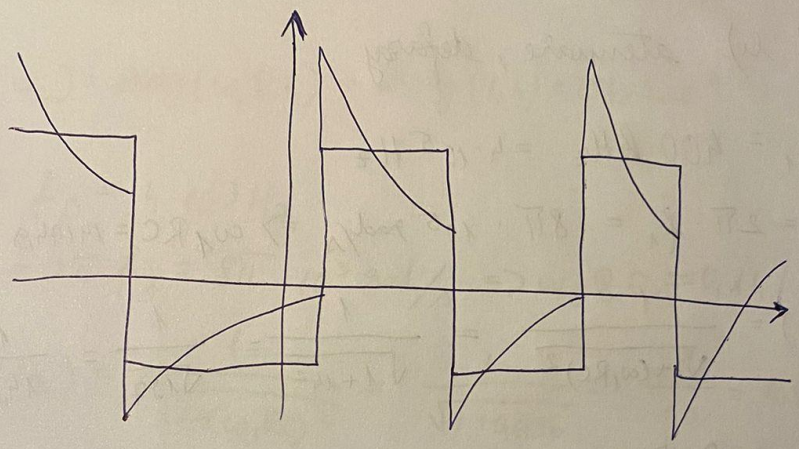


3.1.2) $R = 12\,k\Omega$, $C = 470\,nF$, $A = 5\,V$

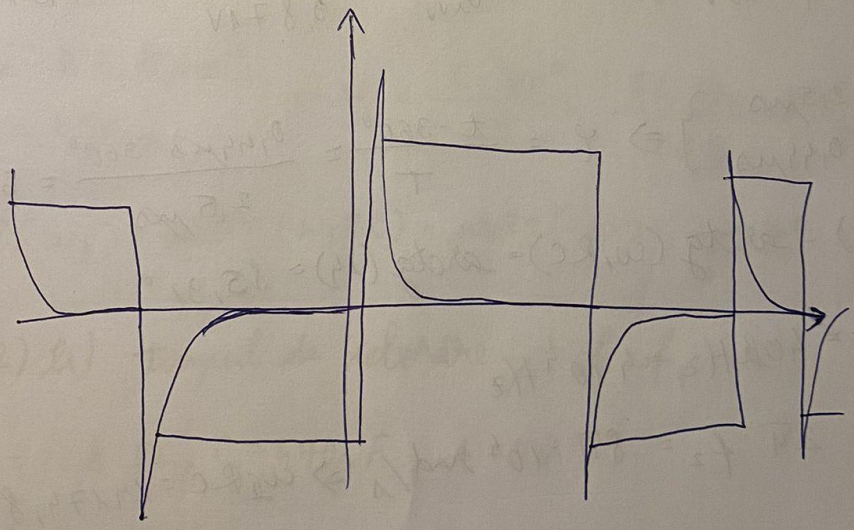
a) $f_1 = 400\,kHz$



b) $f_2 = 40kHz$



c) $f_3 = 4kHz$



- Calcule teoretice

3.1.1) a) atenuare, defazaj

pt $f_1 = 400\,kHz = 4 \cdot 10^5\,Hz$

$\omega_1 = 2\pi \cdot f_1 = 8\pi \cdot 10^5\,rad/s \Rightarrow \omega_1 RC = 14,1749 \cdot 10^{-3} \simeq 14$

$$A(\omega_1) = \frac{1}{\sqrt{1+(\omega_1 RC)^2}} = \frac{1}{\sqrt{1+14^2}} = \frac{1}{\sqrt{197}} = \frac{1}{14,036} =$$

$$= 0,071$$

$$\left.\begin{array}{l} U_{iv} = 9,871\,V \\ U_{ev} = 4,9023\,V \end{array}\right\} \Rightarrow A = \frac{U_{ev}}{U_{iv}} = \frac{4,9023\,V}{9,871\,V} = 0,497$$

$$\left.\begin{array}{l} T = 2,15\,\mu s \\ t = 0,144\,\mu s \end{array}\right\} \Rightarrow \varphi = \frac{t \cdot 360^\circ}{T} = \frac{0,144\,\mu s \cdot 360^\circ}{2,15\,\mu s} = 63,36^\circ$$

$\varphi(\omega_1) = \text{arctg}(\omega_1 RC) = \text{arctg}(14) = 85,91^\circ$

pt $f_2 = 40\,kHz = 4 \cdot 10^4\,Hz$

$\omega_2 = 2\pi \cdot f_2 = 8\pi \cdot 10^4\,rad/s \Rightarrow \omega_2 RC = 14,174,8 \cdot 10^{-4}$

$\simeq 1,4$

$$A(\omega_2) = \frac{1}{\sqrt{1+(\omega_2 RC)^2}} = \frac{1}{\sqrt{1+(1,4)^2}} = \frac{1}{\sqrt{2,96}} = \frac{1}{1,72} = 0,581$$

$$\left.\begin{array}{l} U_{iv} = 9,9698\,V \\ U_{ev} = 4,059\,V \end{array}\right\} \Rightarrow A = \frac{U_{ev}}{U_{iv}} = \frac{4,059\,V}{9,9698\,V} = 0,407$$

$T = 25\mu s$
$t = 2,418\mu s$
$\Rightarrow \varphi = \frac{t \cdot 360^\circ}{T} = \frac{2,418\mu s \cdot 360^\circ}{25\mu s} = 34,82^\circ$

$\varphi(\omega_2) = \text{arctg}(\omega_2 RC) = \text{arctg}(1,4) = 54,462^\circ$

$f_3 = 4 \cdot 10^3 Hz$

$\omega_3 = 2\pi f_3 = 8\pi \cdot 10^3 rad/s \Rightarrow \omega_3 RC = 0,14$

$A(\omega_3) = \frac{1}{\sqrt{1+(\omega_3 RC)^2}} = \frac{1}{\sqrt{1+0,0196}} = \frac{1}{1,01} = 0,99$

$U_{iw} = 9,969V$
$U_{ew} = 0,71V$
$\Rightarrow A = \frac{U_{ew}}{U_{iw}} = \frac{0,71V}{9,969V} = 0,071$

$t = 62,5\mu s$
$T = 250\mu s$
$\Rightarrow \varphi = \frac{t \cdot 360^\circ}{T} = \frac{62,5\mu s \cdot 360^\circ}{250\mu s} = 90^\circ$

$\varphi(\omega_3) = \text{arctg}(\omega_3 RC) = \text{arctg}(0,14) = 7,97^\circ$

3.1.2) b) timpul de calculare pt $f = f_1$

$R = 12k\Omega$, $C = 470nF$, $A = 5V$

$f_1 = 4 \cdot 10^5 Hz$

$t_{c\,masurat} = 1,146\mu s$

$t_{c\,teoretic} = R \cdot C \cdot \ln\frac{0-0,9u}{0-0,1u} = RC \cdot 2,2$

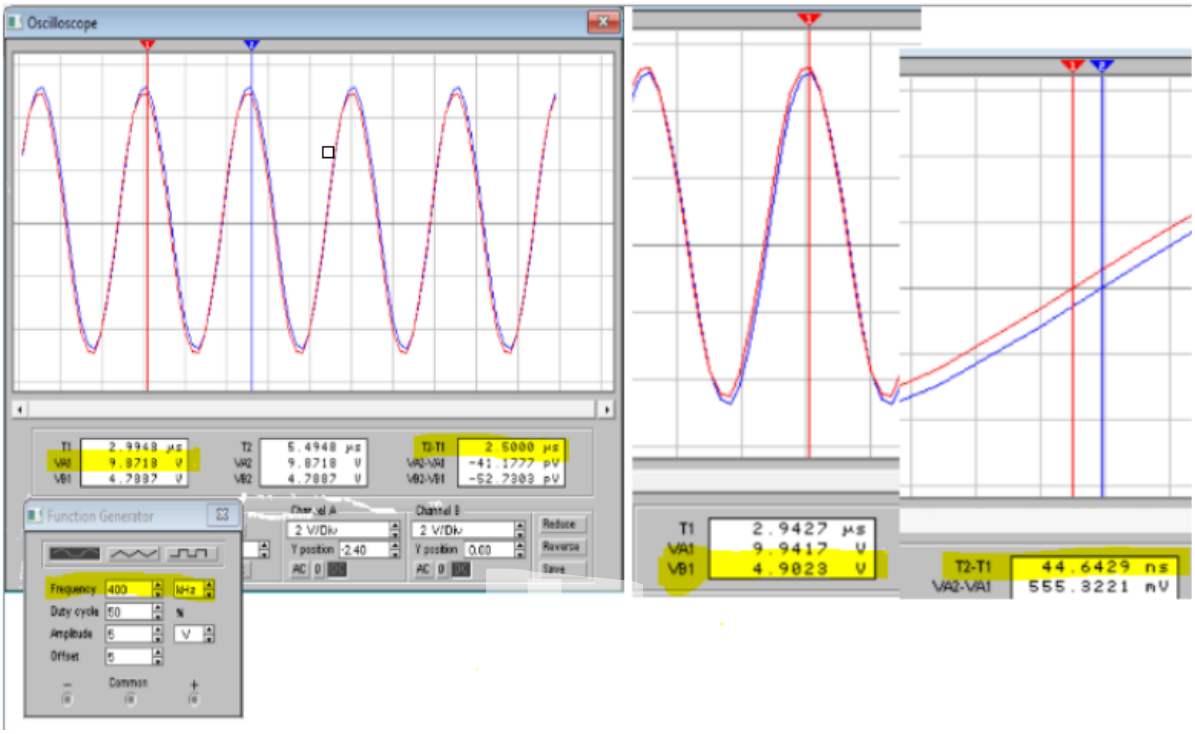
$t_{c\,teoretic} = 2{,}2 \cdot 12 \cdot 10^{3} \cdot \cdot 47 \cdot 10^{-11} = 1240{,}8 \cdot 10^{-8}\,s$

$= 12{,}408\,\mu s$

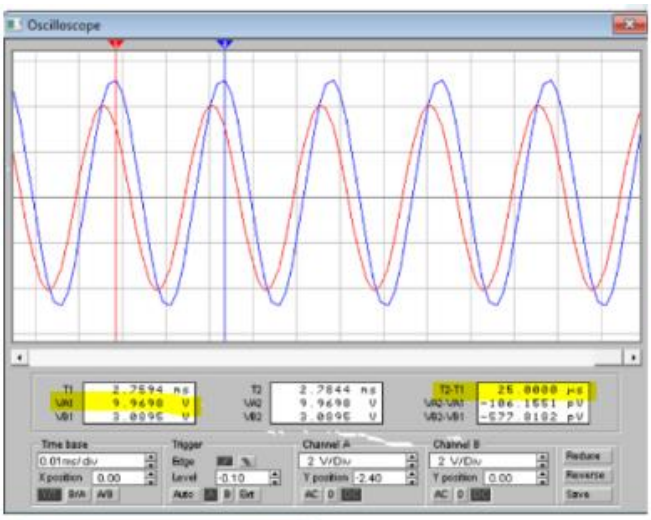
Masuratori obtinute prin simulare si diagrame :

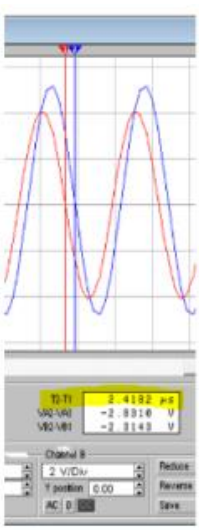
3.1.1)

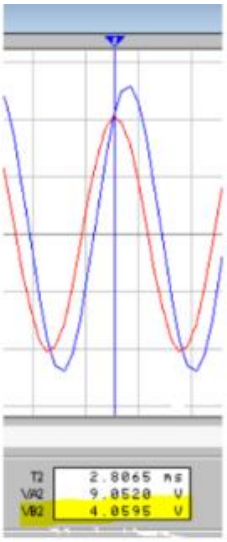
f1 = 400kHz

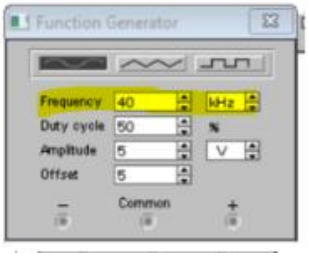


f2 = 40kHz

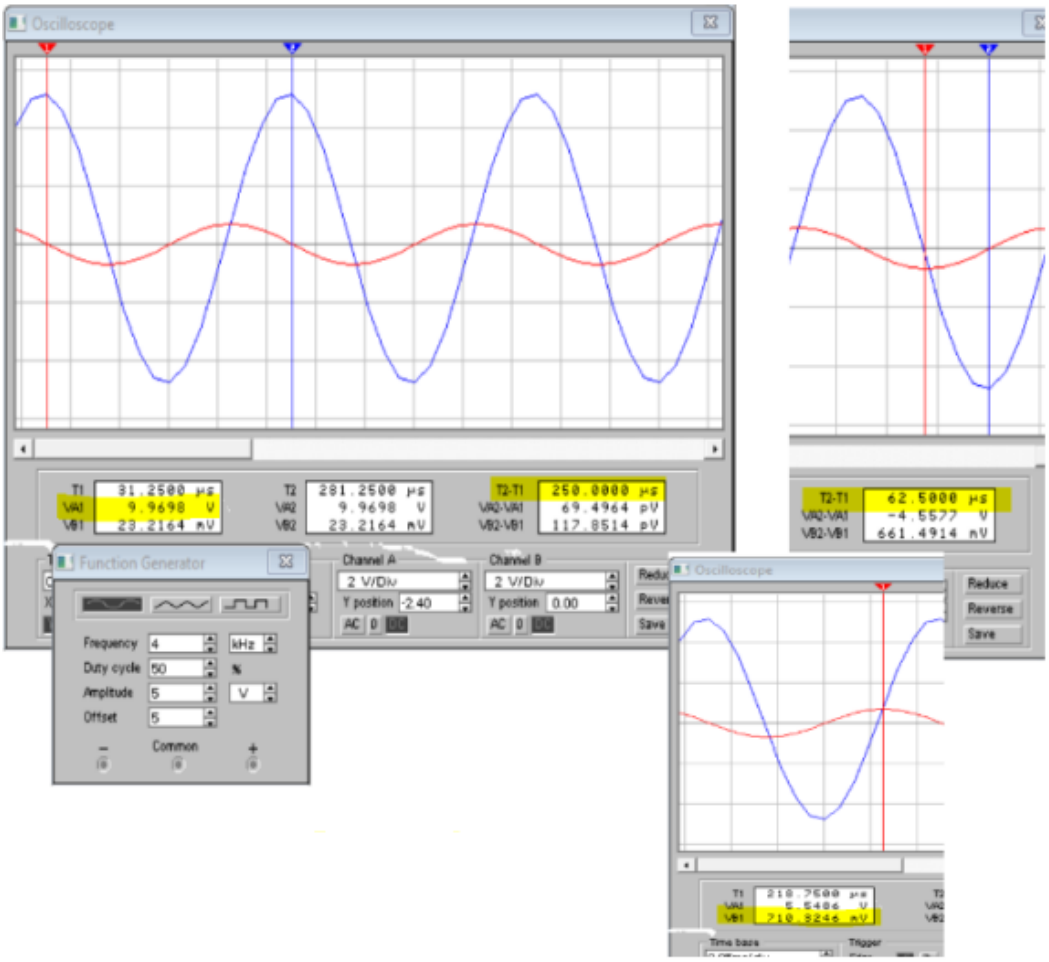

Oscilloscope
T1 2.7694 ns
VA1 9.9698 V
VB1 3.0095 V
T2 2.7844 ns
VA2 9.9698 V
VB2 3.0095 V
T2-T1 25.0000 µs
VA2-VA1 -106.1651 pV
VB2-VB1 -577.9102 pV
Time base
0.01ms/div
X position 0.00
Trigger
Edge
Level -0.10
Auto B Ext
Channel A
2 V/Div
Y position -2.40
Channel B
2 V/Div
Y position 0.00
Reduce
Reverse
Save


T2-T1 2.4182 µs
VA2-VA1 -2.8816 V
VB2-VB1 -2.8143 V
2 V/Div
Y position 0.00
Reduce
Reverse
Save


T2 2.8065 ns
VA2 9.0520 V
VB2 4.0595 V

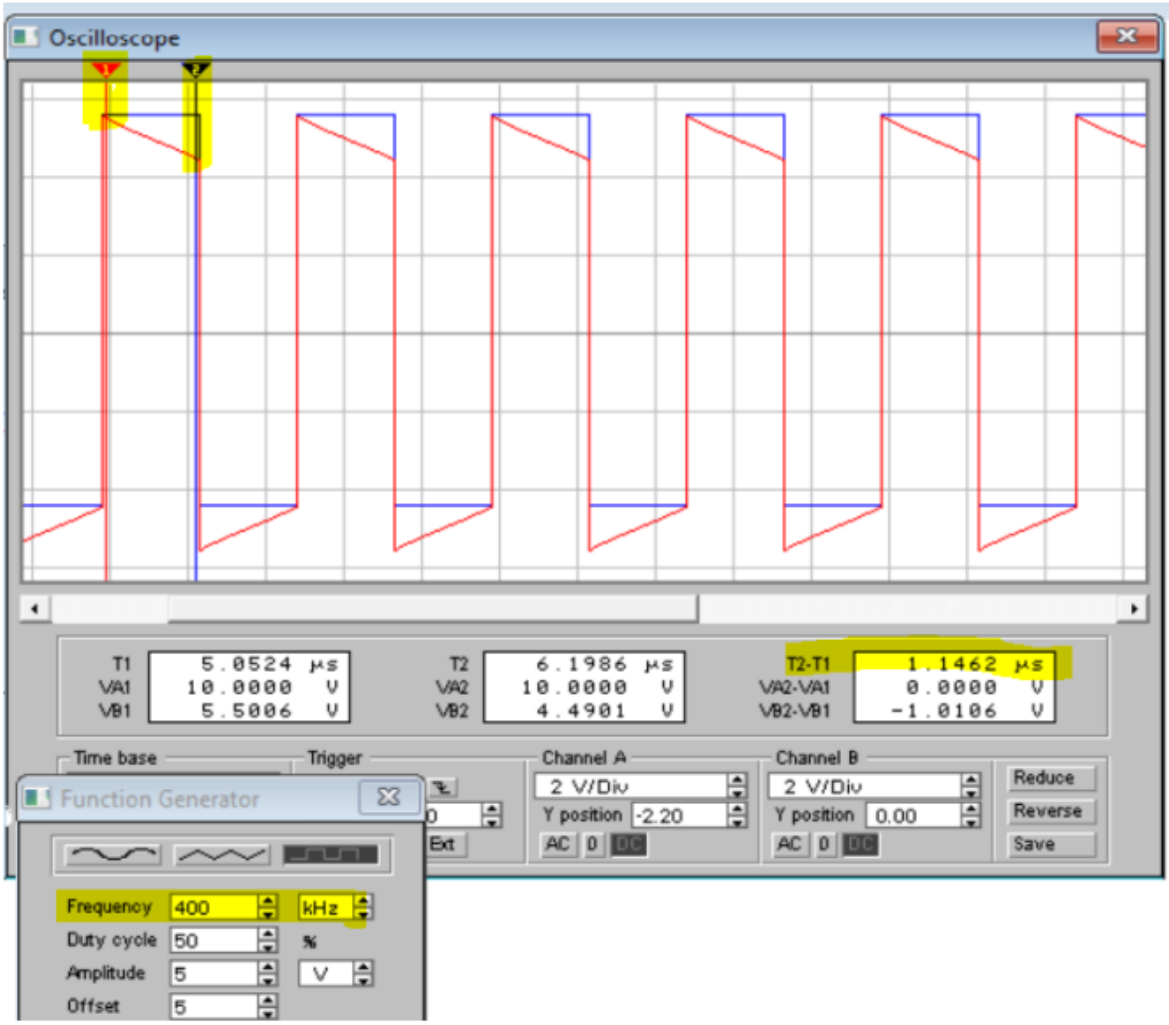

Function Generator
Frequency 40 kHz
Duty cycle 50 %
Amplitude 5 V
Offset 5
Common

f3 = 4 kHz

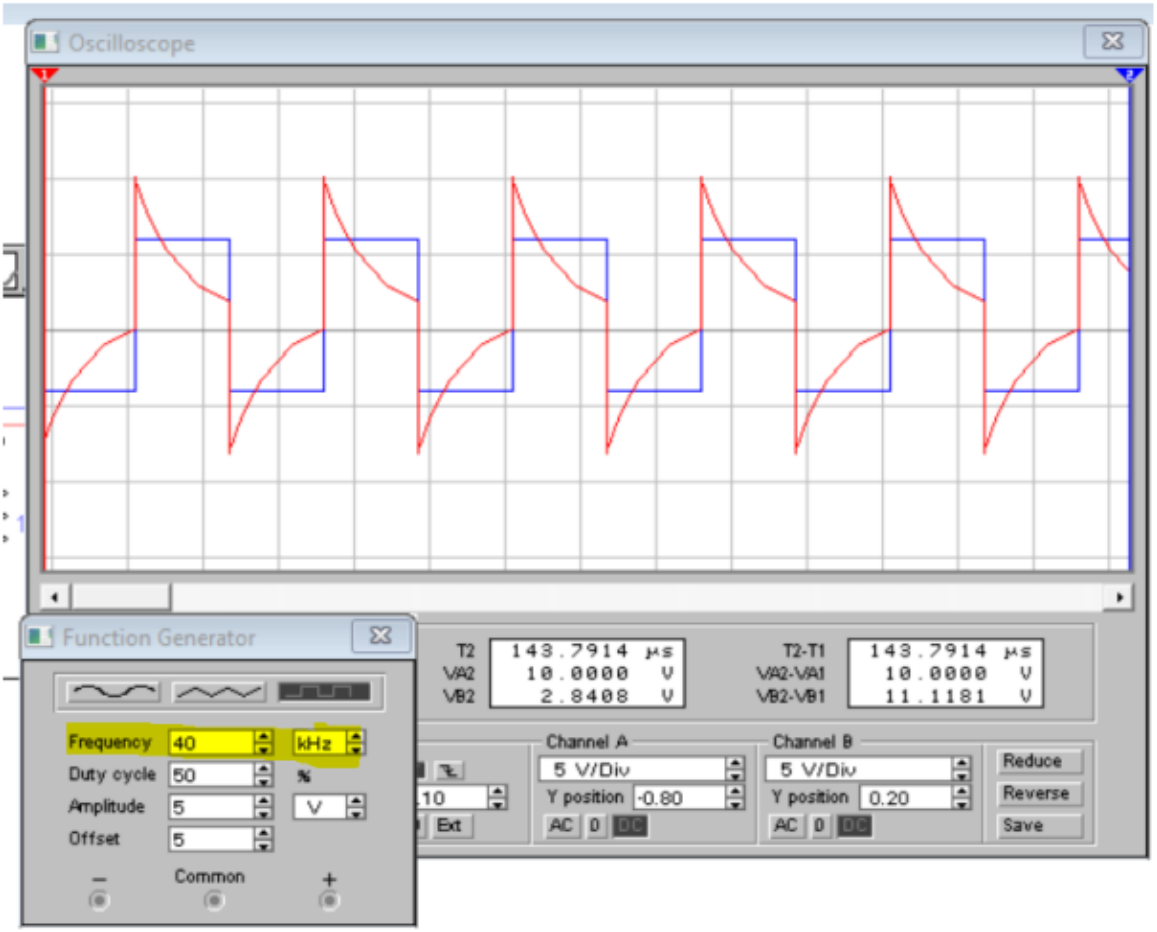

Oscilloscope
T1 31.2500 µs
VA1 9.9698 V
VB1 23.2164 mV
T2 281.2500 µs
VA2 9.9698 V
VB2 23.2164 mV
T2-T1 250.0000 µs
VA2-VA1 69.4964 pV
VB2-VB1 117.8514 pV
T2-T1 62.5000 µs
VA2-VA1 -4.5577 V
VB2-VB1 661.4914 mV
Function Generator
Frequency 4 kHz
Duty cycle 50 %
Amplitude 5 V
Offset 5
Common
Channel A
2 V/Div
Y position -2.40
AC 0 DC
Channel B
2 V/Div
Y position 0.00
AC 0 DC
Reduce
Reverse
Save
Oscilloscope
T1 210.7500 µs
5.5406 V
710.8246 mV
Time base
Trigger

3.1.2)

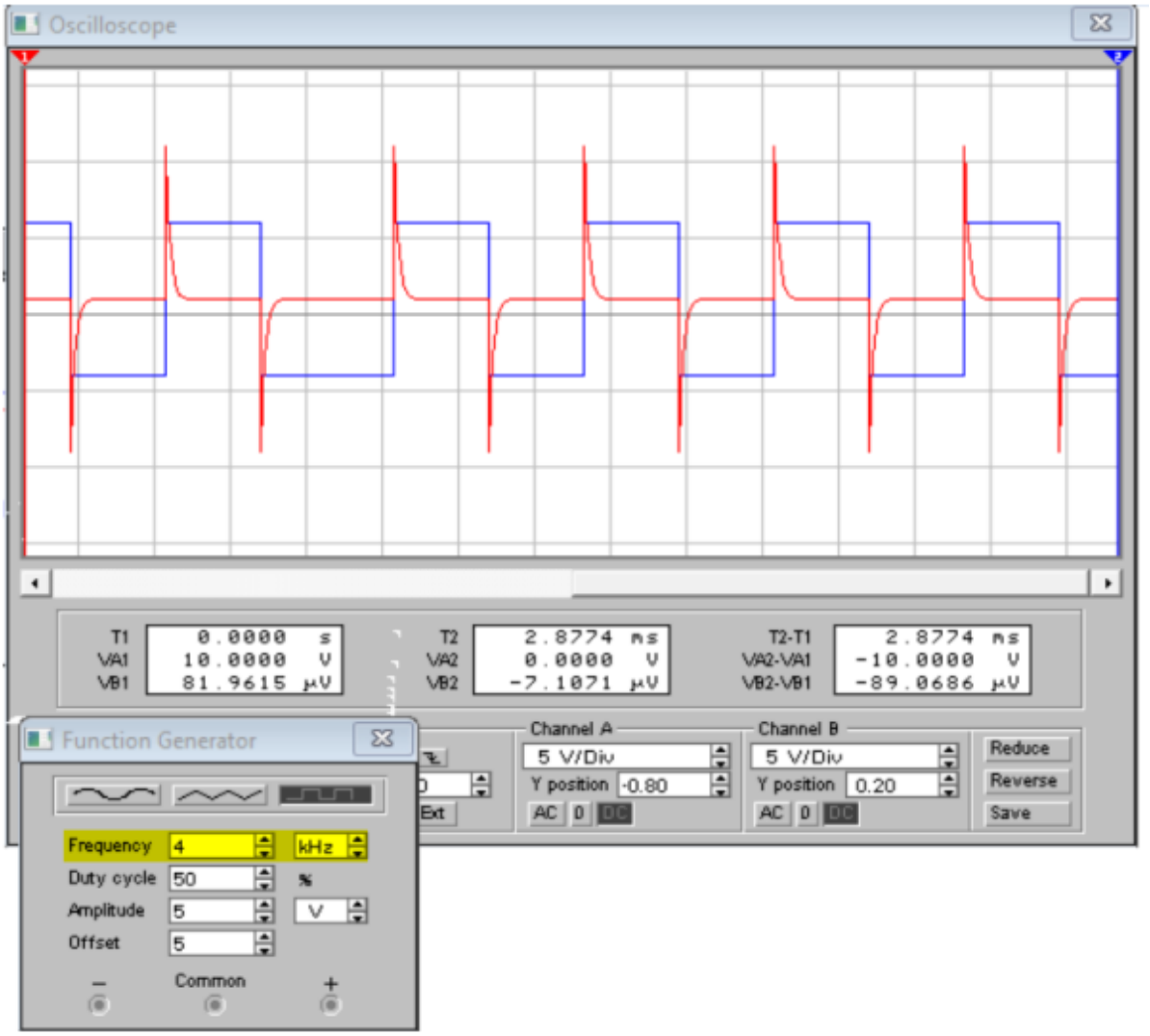
f1 = 400kHz



f2 = 40 kHz


Oscilloscope
Function Generator
Frequency 40 kHz
Duty cycle 50 %
Amplitude 5 V
Offset 5
Common
T2 143.7914 µs
VA2 10.0000 V
VB2 2.8408 V
T2-T1 143.7914 µs
VA2-VA1 10.0000 V
VB2-VB1 11.1181 V
Channel A
5 V/Div
Y position -0.80
AC 0 DC
Channel B
5 V/Div
Y position 0.20
AC 0 DC
Ext
Reduce
Reverse
Save

f3 = 4 kHz


Oscilloscope
T1 0.0000 s
VA1 10.0000 V
VB1 81.9615 µV
T2 2.8774 ms
VA2 0.0000 V
VB2 -7.1071 µV
T2-T1 2.8774 ms
VA2-VA1 -10.0000 V
VB2-VB1 -89.0686 µV
Channel A
5 V/Div
Y position -0.80
AC 0 DC
Channel B
5 V/Div
Y position 0.20
AC 0 DC
Reduce
Reverse
Save
Ext
Function Generator
Frequency 4 kHz
Duty cycle 50 %
Amplitude 5 V
Offset 5
Common