Laza Denard
Grupa 4.2.

Aplicatia 2

Circuite liniare RC trece - sus

3.1.1. Semnal sinusoidal

$R = 12\ k\Omega$

$C = 470\ pF$

$A = 5V$

a.) $f = 400\ kHz \Rightarrow \omega = 800\pi \cdot 10^3$

$$A(\omega) = \frac{1}{\sqrt{1+\left(\frac{1}{\omega RC}\right)^2}} = \frac{1}{\sqrt{1+\left(\frac{1}{800\pi \cdot 10^3 \cdot 12 \cdot 10^3 \cdot 470 \cdot 10^{-12}}\right)^2}}$$

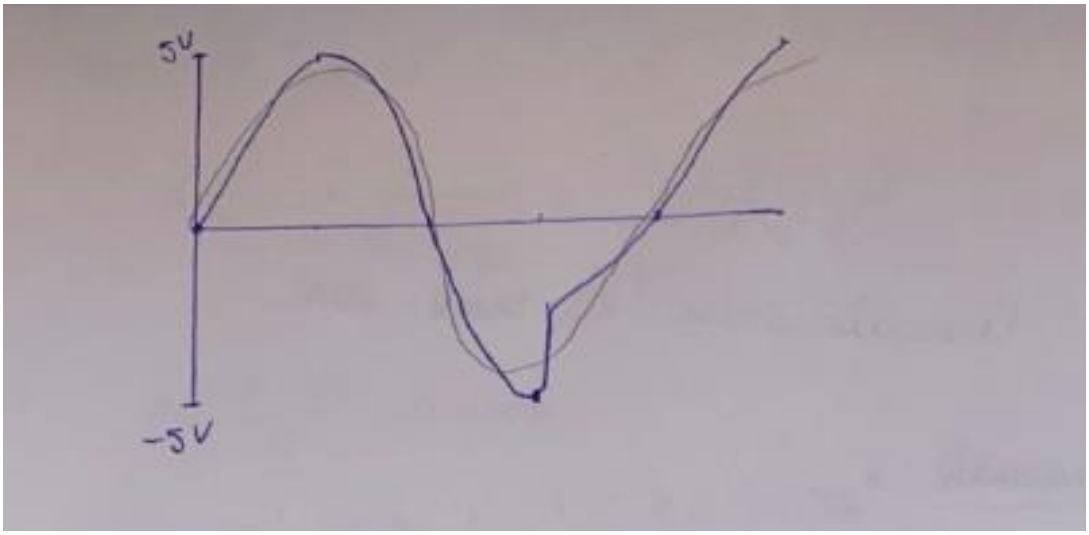
$$= \frac{1}{\sqrt{1+\frac{1}{(4,5127)^2}}} = \frac{1}{\sqrt{1+\frac{1}{200,9}}} = \frac{1}{\sqrt{1,005}} = 0,997$$

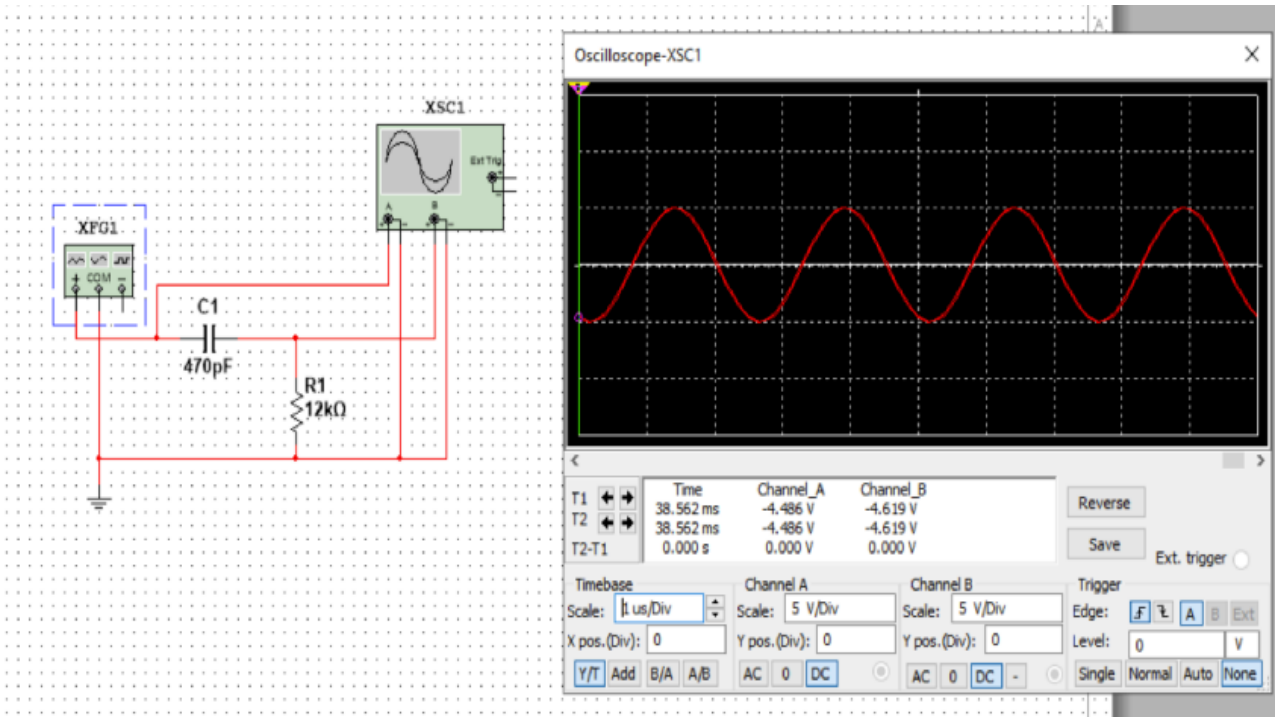
$$A = \frac{U_1}{U_e} = \frac{4,987}{5} = 0,9974$$

$$\varphi(\omega) = \operatorname{arctg}\left(\frac{1}{\omega RC}\right) = \operatorname{arctg}\left(\frac{1}{4,5127}\right) = \operatorname{arctg}\left(\frac{1}{14,174}\right)$$

$$= 0,07^\circ$$

$$\varphi = 347 \cdot 10^{-12} \cdot 560,4 \cdot 10^5 = 0,05^\circ$$


5V
-5V


XSC1
XFG1
COM
C1
470pF
R1
12kΩ
Oscilloscope-XSC1
Time
Channel_A
Channel_B
T1
38.562 ms
-4.486 V
-4.619 V
T2
38.562 ms
-4.486 V
-4.619 V
T2-T1
0.000 s
0.000 V
0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 1 us/Div
X pos.(Div): 0
Y/T
Add
B/A
A/B
Channel A
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Channel B
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Trigger
Edge:
A
B
Ext
Level: 0 V
Single
Normal
Auto
None

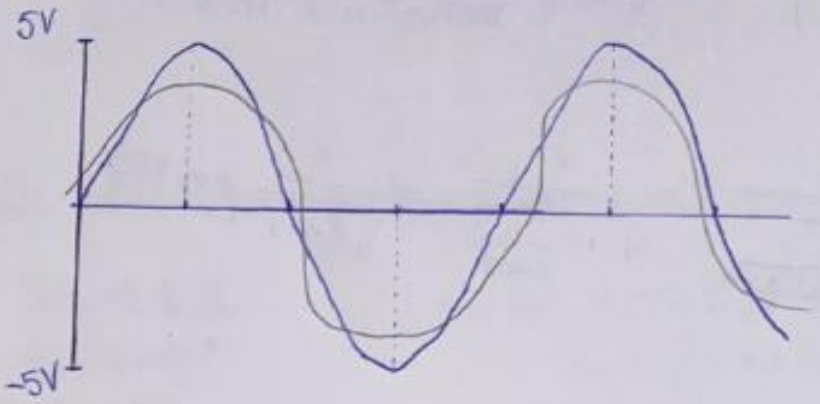
b) $f = 40\ kHz \Rightarrow \omega = 80\pi \cdot 10^3$

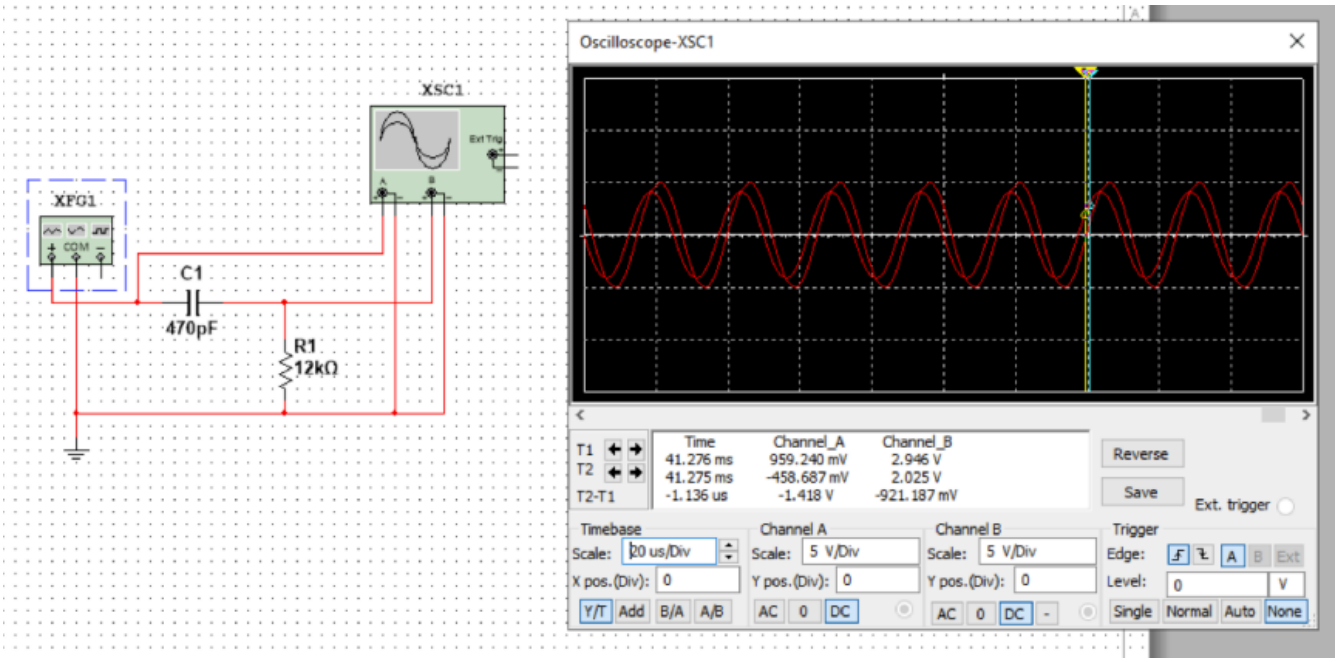
$$A(\omega) = \frac{1}{\sqrt{1 + \frac{1}{2,01}}} = \frac{1}{\sqrt{1,5}} = 0,816$$

$$A = \frac{4,08}{5} = 0,82$$

$$\varphi(\omega) = \operatorname{arctg}\left(\frac{1}{1,4174}\right) = 35,20°$$

$$\varphi = 2,273 \cdot 10^{-6} \cdot 360 \cdot 4 \cdot 10^4 = 32,73°$$





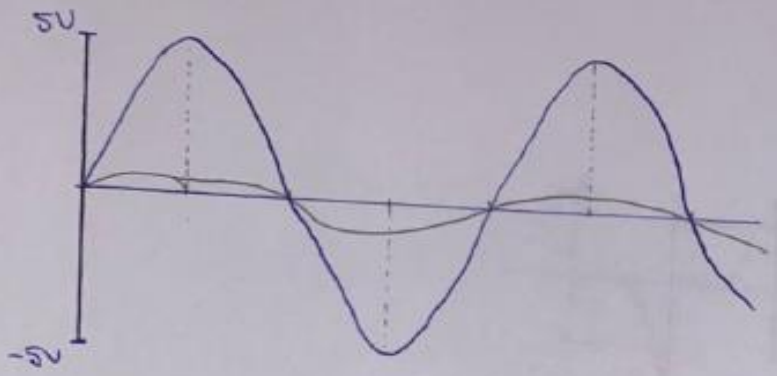
c.) $f = 1\,kHz \Rightarrow \omega = 2\pi \cdot 10^3$

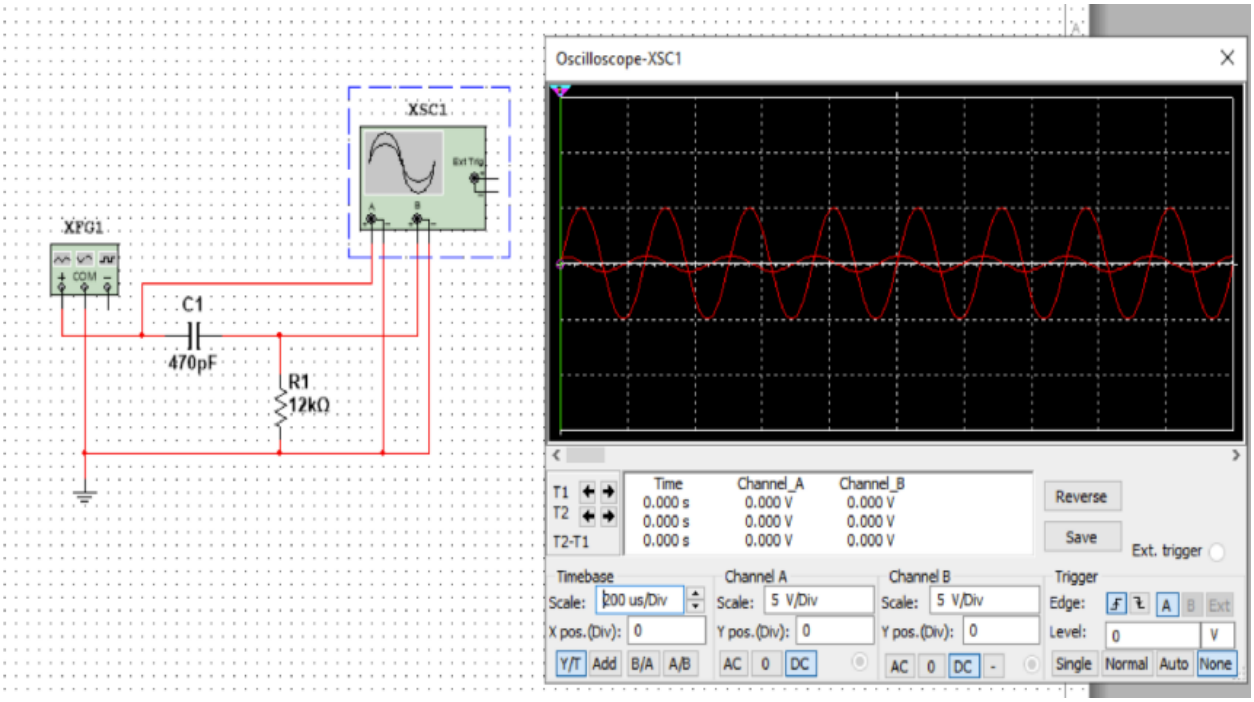
$$A(\omega) = \frac{1}{\sqrt{1+\frac{1}{0,02}}} = \frac{1}{\sqrt{50,75}} = \frac{1}{7,053} = 0,1414$$

$$A = \frac{0,703}{5} = 0,1406$$

$$\varphi(\omega) = \operatorname{arctg}\left(\frac{1}{0,142}\right) = 81,92^\circ$$

$$\varphi = 56,92 \cdot 10^{-6} \cdot 360 \cdot 4 \cdot 10^3 = 81,96^\circ$$





3.12. Semnalul rectangular

$R = 12\,k\Omega$

$C = 470\,pF$

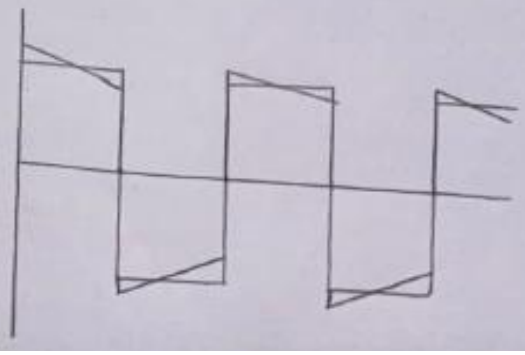
$A = 5V$

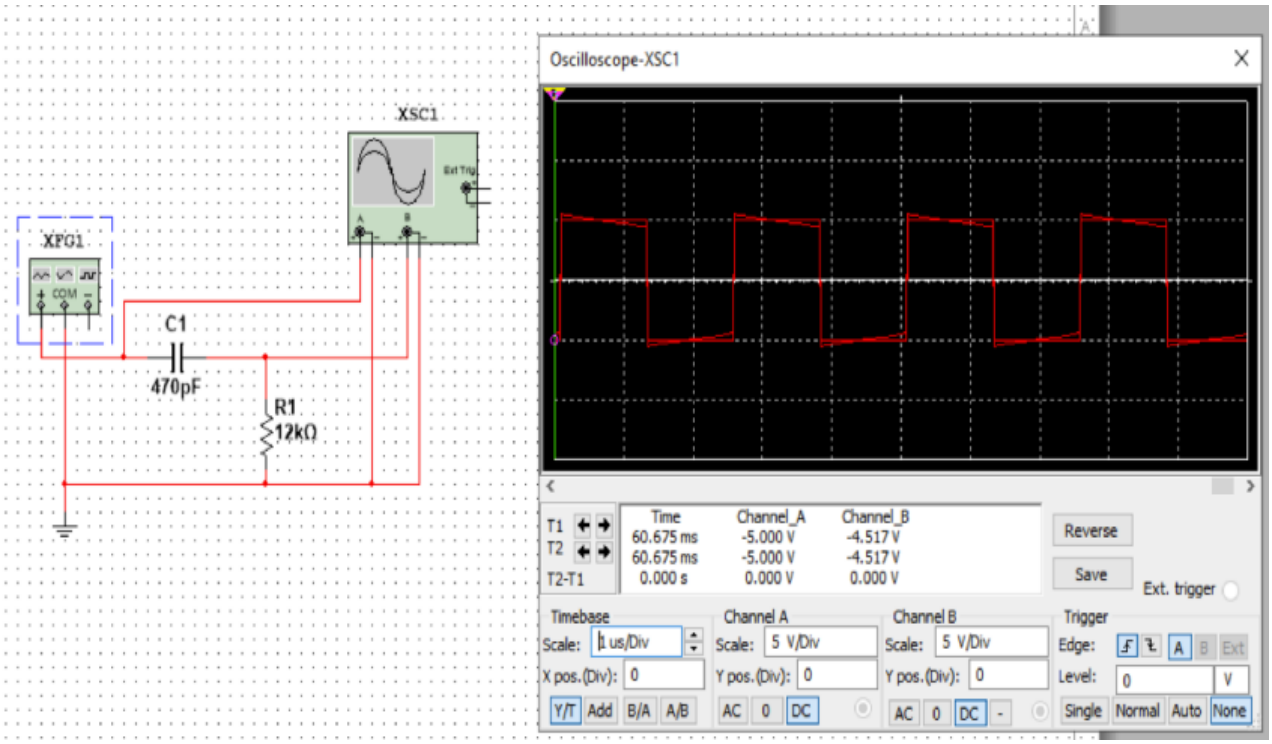
$\tau = RC \Rightarrow \tau = 5,64 \cdot 10^{-6}$

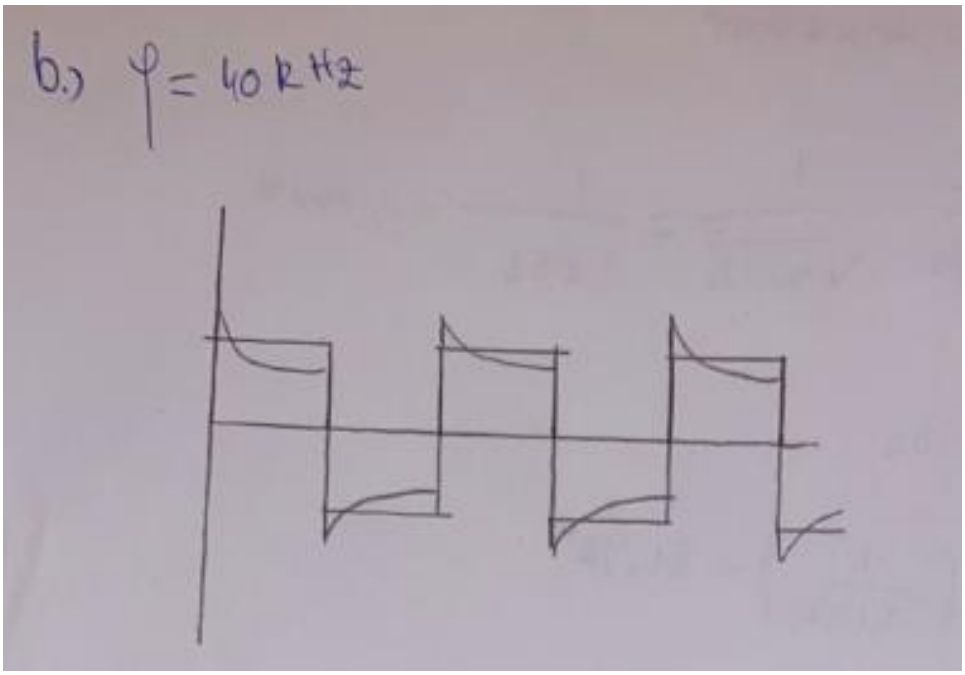
$t_c = \frac{T}{5} = 1,121\,\mu s$ (teoretic)

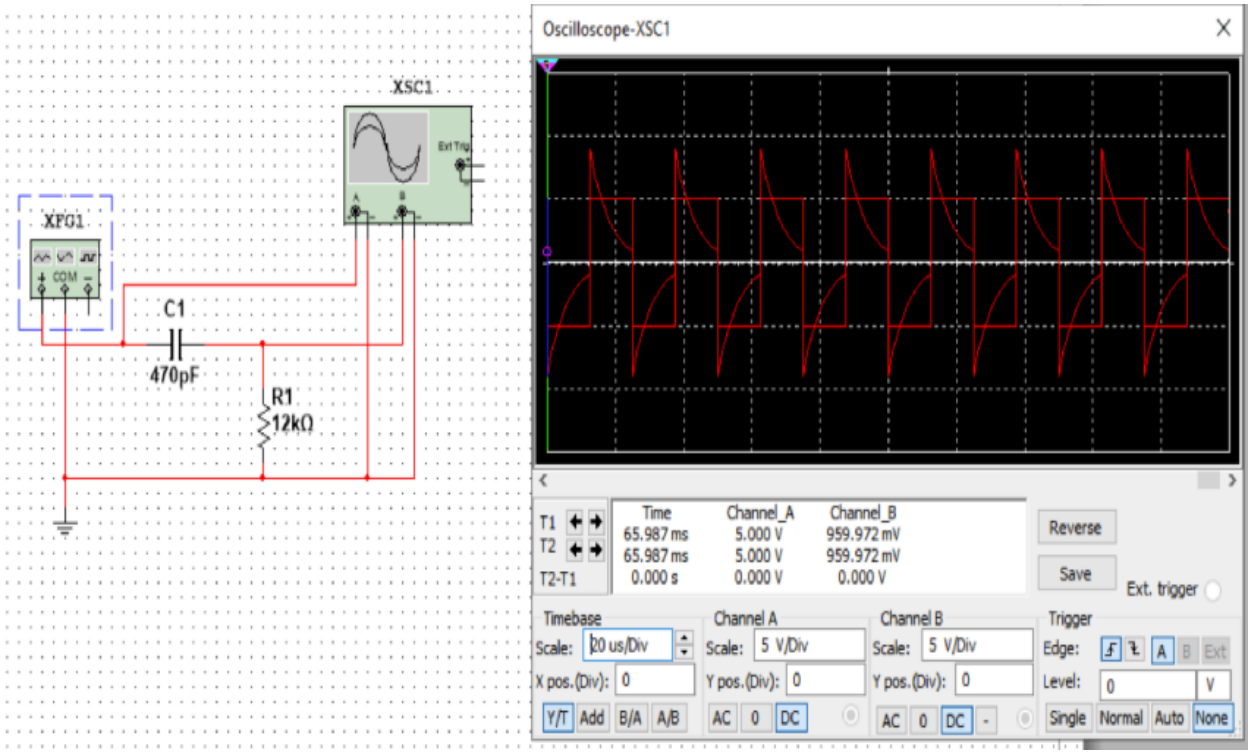
$t_c = 1,125\,\mu s$ (exp)

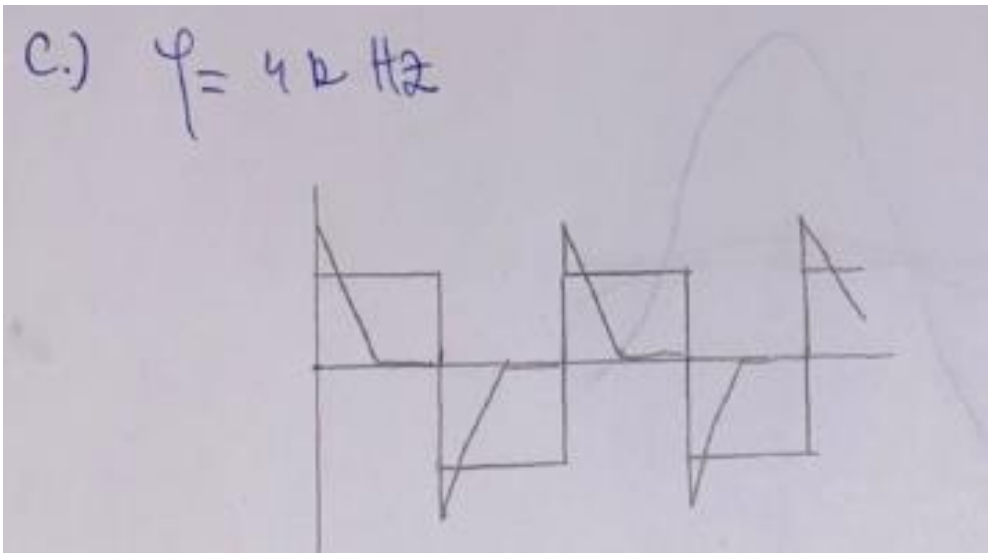
a) $\varphi = 400\,kHz$

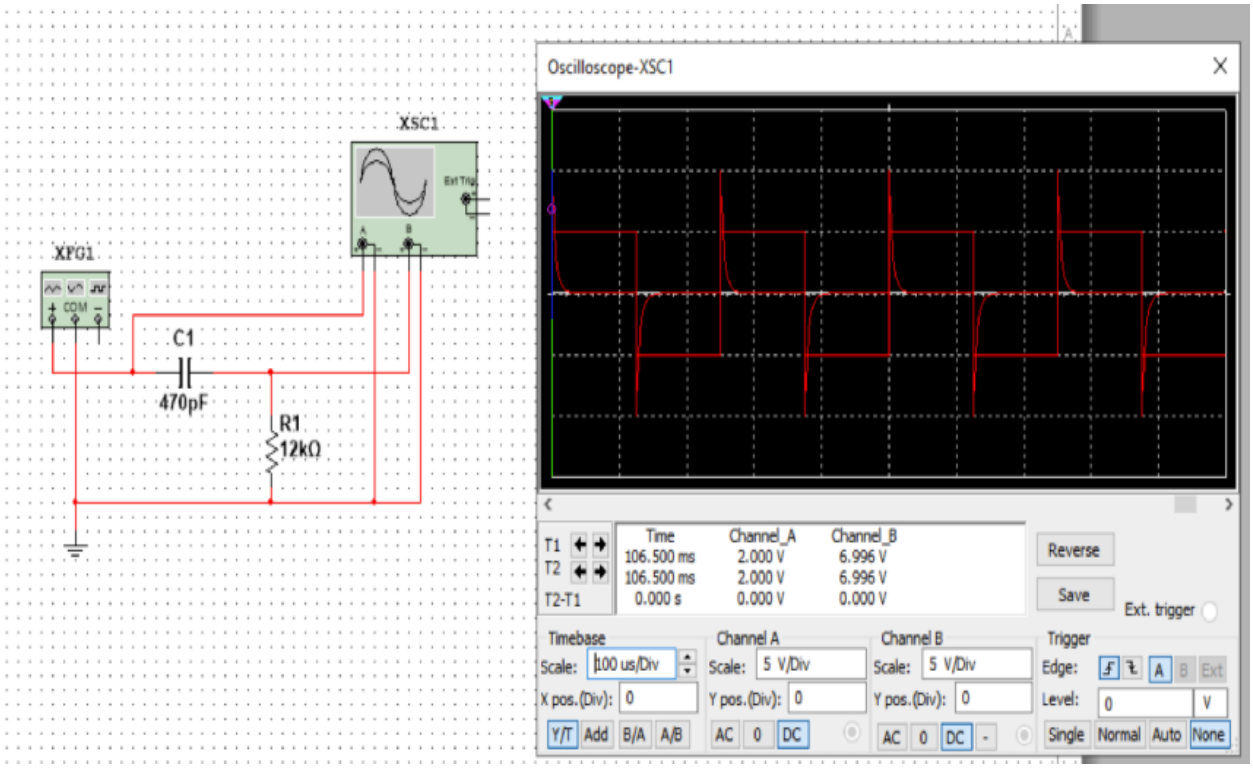





b.) f = 40 KHz


XSC1
XFG1
COM
C1
470pF
R1
12kΩ
Oscilloscope-XSC1
Time
Channel_A
Channel_B
T1
65.987 ms
5.000 V
959.972 mV
T2
65.987 ms
5.000 V
959.972 mV
T2-T1
0.000 s
0.000 V
0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 20 us/Div
X pos.(Div): 0
Y/T
Add
B/A
A/B
Channel A
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Channel B
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Trigger
Edge:
Level: 0 V
Single
Normal
Auto
None


C.) f = 4 kHz


XSC1
XFG1
COM
C1
470pF
R1
12kΩ
Oscilloscope-XSC1
Time
Channel_A
Channel_B
T1
106.500 ms
2.000 V
6.996 V
T2
106.500 ms
2.000 V
6.996 V
T2-T1
0.000 s
0.000 V
0.000 V
Reverse
Save
Ext. trigger
Timebase
Scale: 100 us/Div
X pos.(Div): 0
Y/T
Add
B/A
A/B
Channel A
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Channel B
Scale: 5 V/Div
Y pos.(Div): 0
AC
0
DC
Trigger
Edge:
A
B
Ext
Level: 0 V
Single
Normal
Auto
None