WYDZIAŁ
ELEKTROTECHNIKI
I INFORMATYKI
POLITECHNIKI RZESZOWSKIEJ

Katedra Elektrotechniki i Podstaw Informatyki

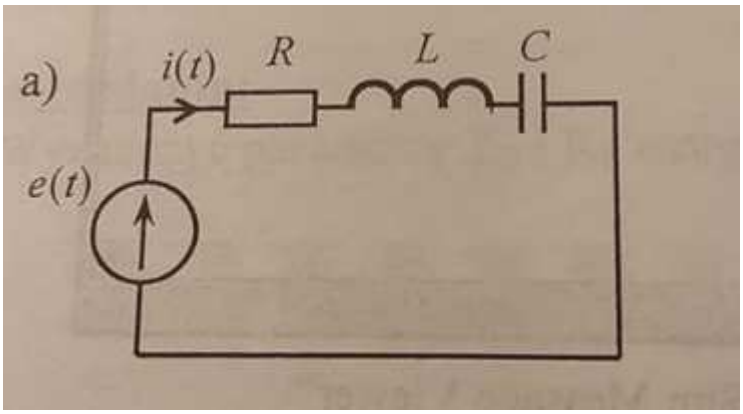
LABORATORIUM OBWODÓW I SYGNAŁÓW

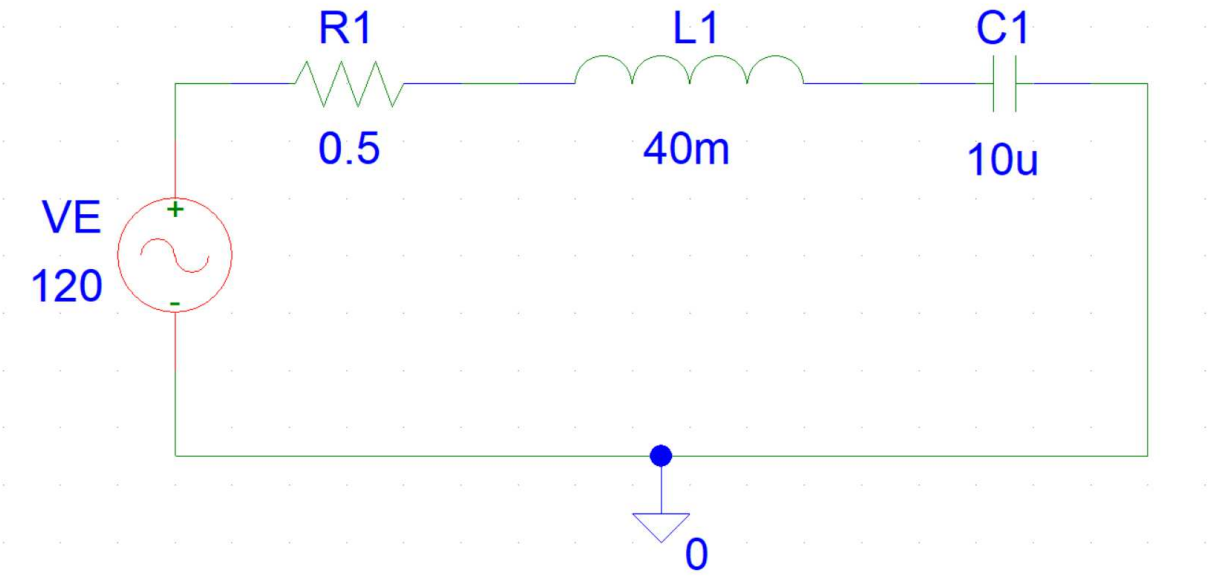
SPRAWOZDANIE

Ćw. nr	Temat		
3	Obwody prądu sinusoidalnie zmiennego.		
Opracowali		**Rok / gr. lab.**	**Data wyk. ćw.**
[redacted]		1ET-DI / L2	27.01.2019

A) Analiza szeregowego obwodu RLC

Dane: R=20Ω , L=40mH, C=10uF e(t)=120pier2sin(1000t)V





Wyniki analizy komputerowej:

**** 01/27/19 13:20:24 ********** Evaluation PSpice (Nov 1999) **********

 * C:\Users\Norbert\Desktop\3 ois\lab_3_1.sch

 ****   CIRCUIT DESCRIPTION

****
****

* Schematics Version 9.1 - Web Update 1
* Sun Jan 27 13:19:40 2019

** Analysis setup **
.OPTIONS NOBIAS
.OPTIONS NOPAGE
.OP
.AC LIN 1 159.1549431 159.1549431
.PRINT AC VM(R_R1) VP(R_R1) VR(R_R1) VI(R_R1)
+VM(L_L1) VP(L_L1) VR(L_L1) VI(L_L1)
+VM(C_C1) VP(C_C1) VR(C_C1) VI(C_C1)
+IM(R_R1) IP(R_R1) IR(R_R1) II(R_R1)

* From [PSPICE NETLIST] section of pspiceev.ini:
.lib "nom.lib"

.INC "lab_3_1.net"

**** INCLUDING lab_3_1.net ****
* Schematics Netlist *

```
L_L1         $N_0001 $N_0002  40m
C_C1         $N_0002 0  10u
V_VE         $N_0003 0  AC 120 0
R_R1         $N_0003 $N_0001  20

**** RESUMING lab_3_1.cir ****
.INC "lab_3_1.als"



**** INCLUDING lab_3_1.als ****
* Schematics Aliases *

.ALIASES
L_L1           L1(1=$N_0001 2=$N_0002 )
C_C1           C1(1=$N_0002 2=0 )
V_VE           VE(+=$N_0003 -=0 )
R_R1           R1(1=$N_0003 2=$N_0001 )
.ENDALIASES


**** RESUMING lab_3_1.cir ****
.probe


.END


 ****     OPERATING POINT INFORMATION      TEMPERATURE =
27.000 DEG C
```

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VM(R_R1) VP(R_R1) VR(R_R1) VI(R_R1) VM(L_L1)

1.592E+02 3.795E+01 7.157E+01 1.200E+01 3.600E+01 7.589E+01

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VP(L_L1) VR(L_L1) VI(L_L1) VM(C_C1) VP(C_C1)

1.592E+02 1.616E+02 -7.200E+01 2.400E+01 1.897E+02 -1.844E+01

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VR(C_C1) VI(C_C1) IM(R_R1) IP(R_R1) IR(R_R1)

1.592E+02 1.800E+02 -6.000E+01 1.897E+00 7.157E+01 6.000E-01

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

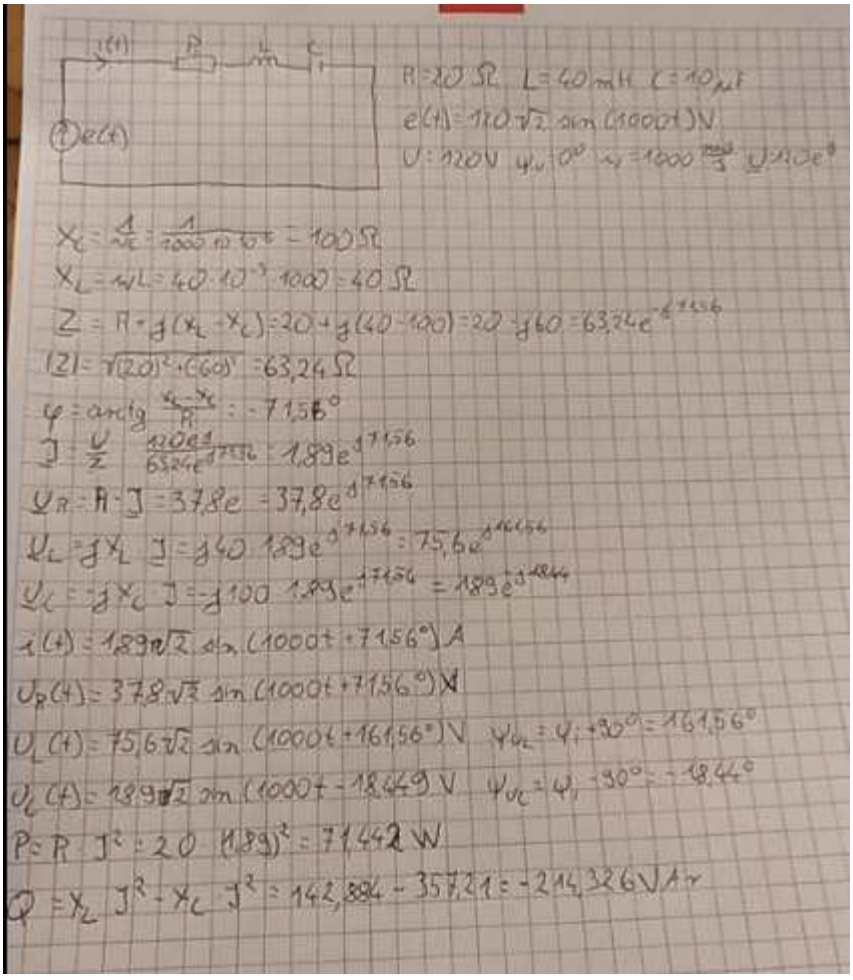
FREQ II(R_R1)

1.592E+02 1.800E+00

JOB CONCLUDED

TOTAL JOB TIME .02

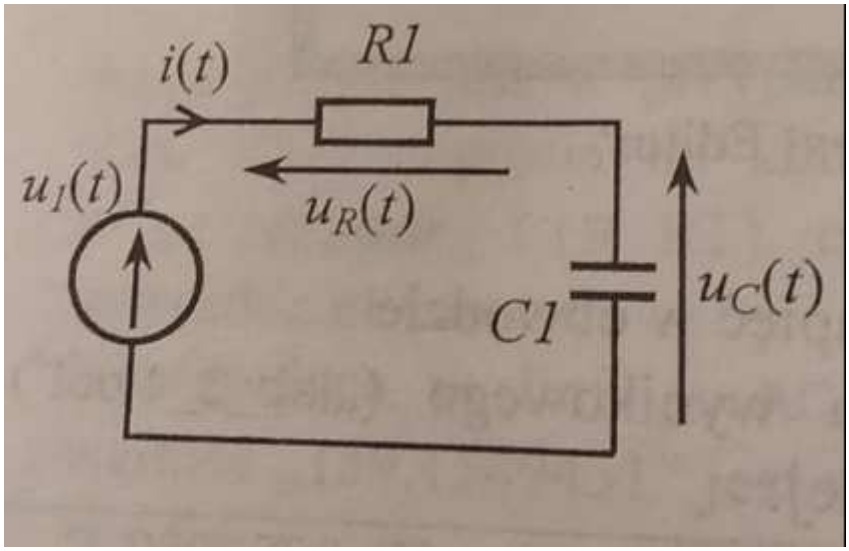
Obliczenia ręczne:

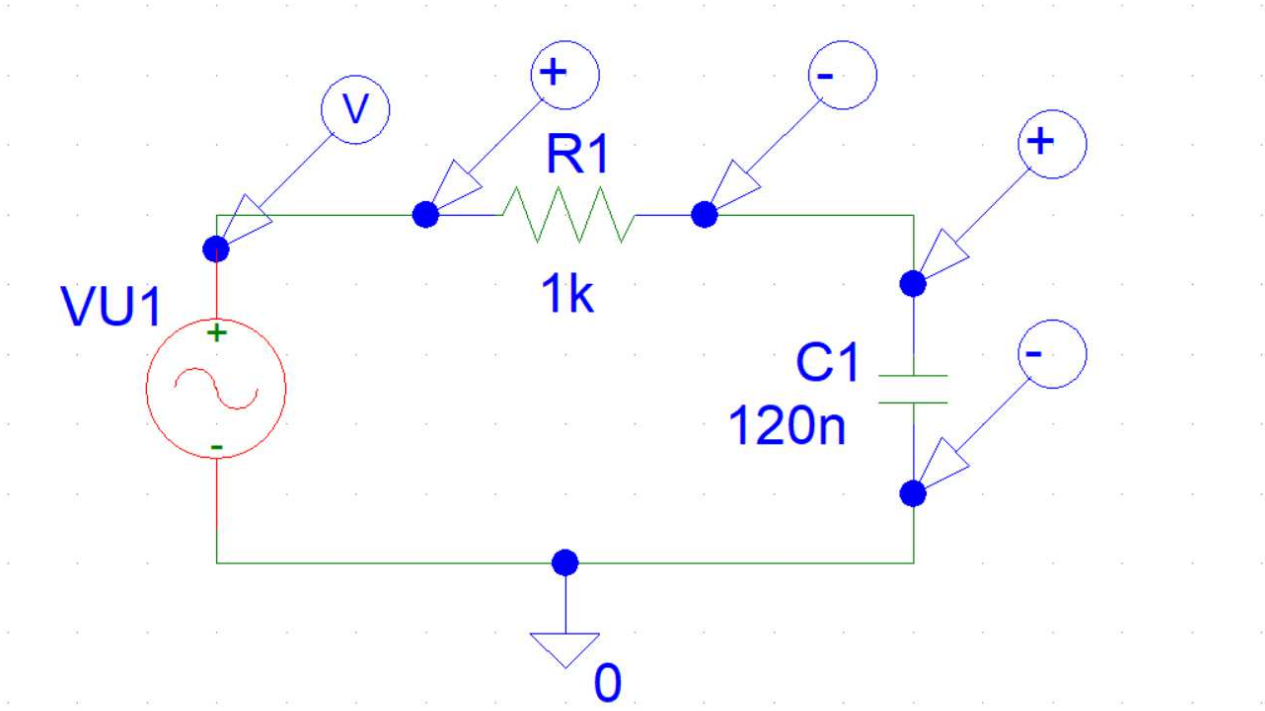


Wielkość	Wynik komputerowy	Wynik ręczny
I[A]	$1,897e^{j71,56}$	$1,89e^{j71,56}$
$\underline{U}_R$[V]	$37,95e^{j71,56}$	$37,8e^{j71,56}$
$\underline{U}_L$[V]	$75,89e^{j161,56}$	$75,6e^{j161,56}$
$\underline{U}_C$[V]	$189,7e^{-j18,44}$	$189e^{-j18,44}$

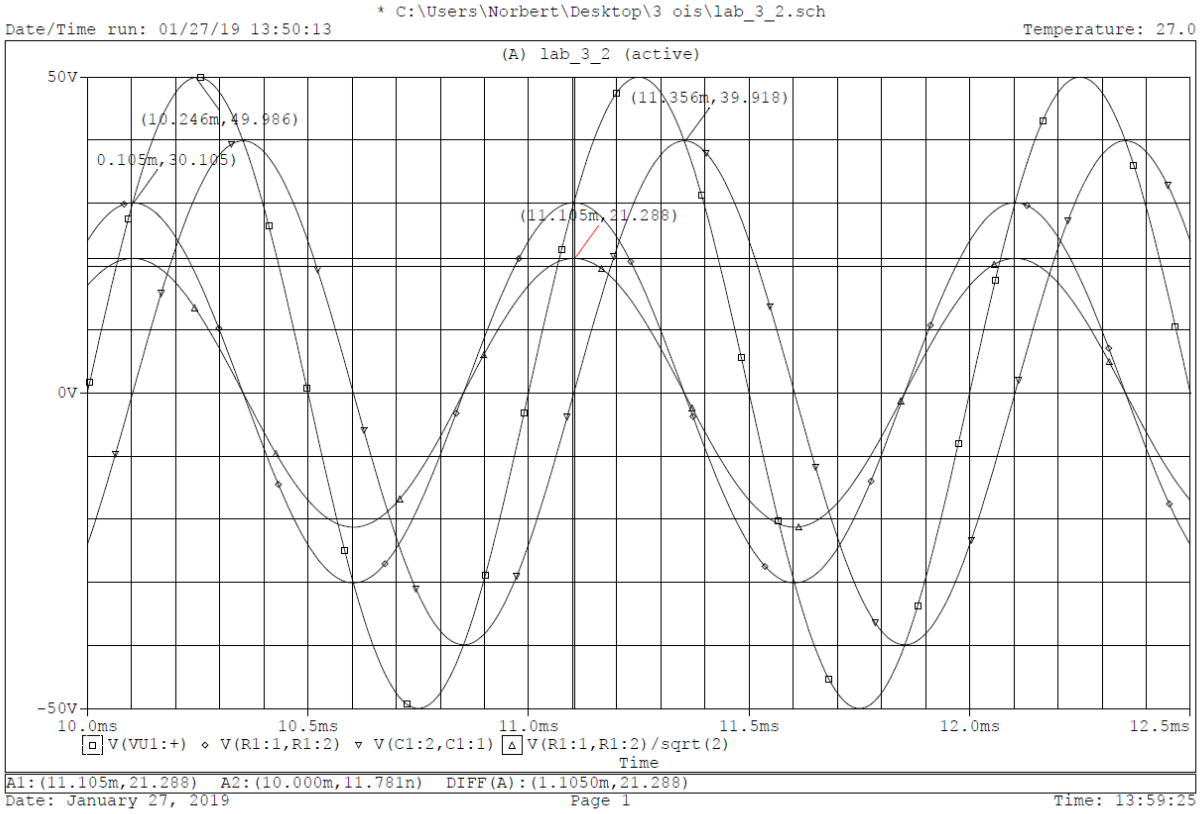
b)Analiza szeregowego obwodu RC

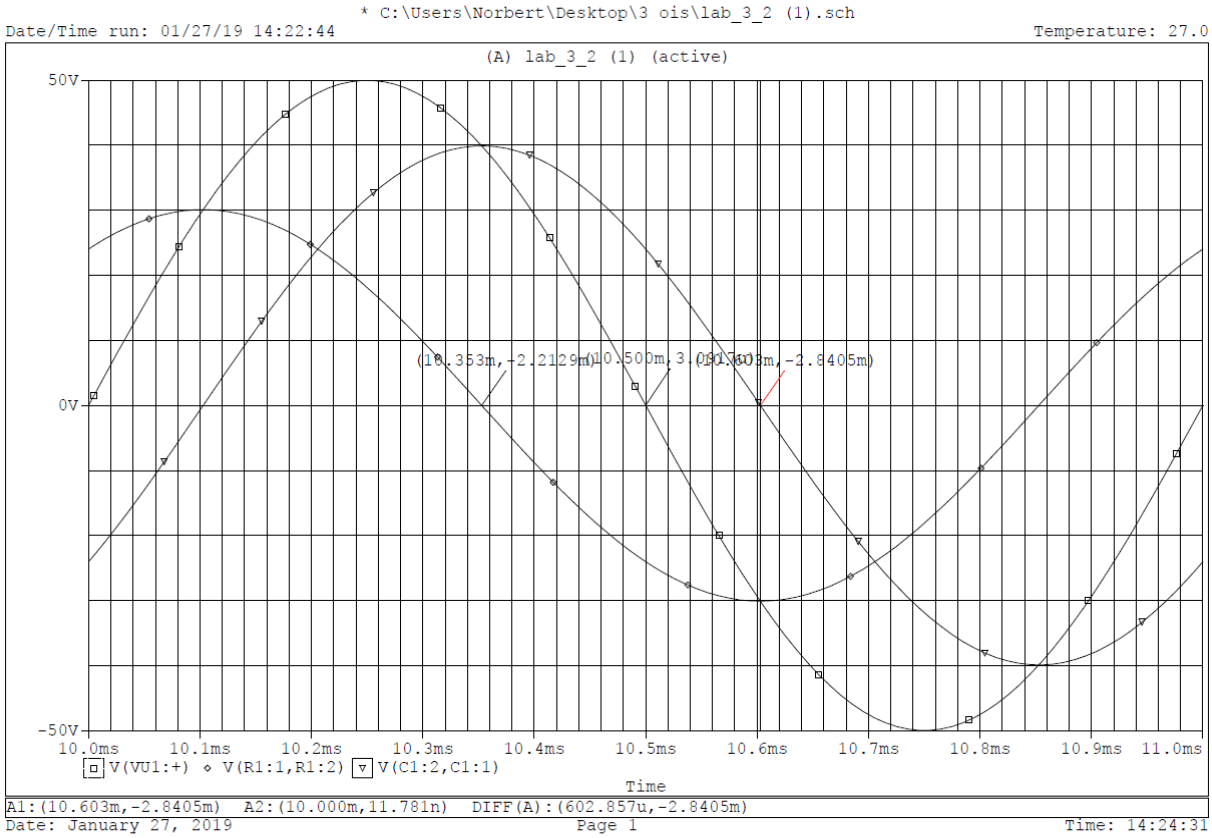
Dane: R1=1k, C1=120nF





Obliczenia komputerowe:





**** 01/27/19 14:22:44 ********** Evaluation PSpice (Nov 1999) **********

 * C:\Users\Norbert\Desktop\3 ois\lab_3_2 (1).sch

 ****   CIRCUIT DESCRIPTION

****
****

* Schematics Version 9.1 - Web Update 1
* Sun Jan 27 14:22:40 2019

** Analysis setup **
.tran 10u 12.5m 10m 10u
.OPTIONS NOBIAS
.OPTIONS NOPAGE
.OP

* From [PSPICE NETLIST] section of pspiceev.ini:
.lib "nom.lib"

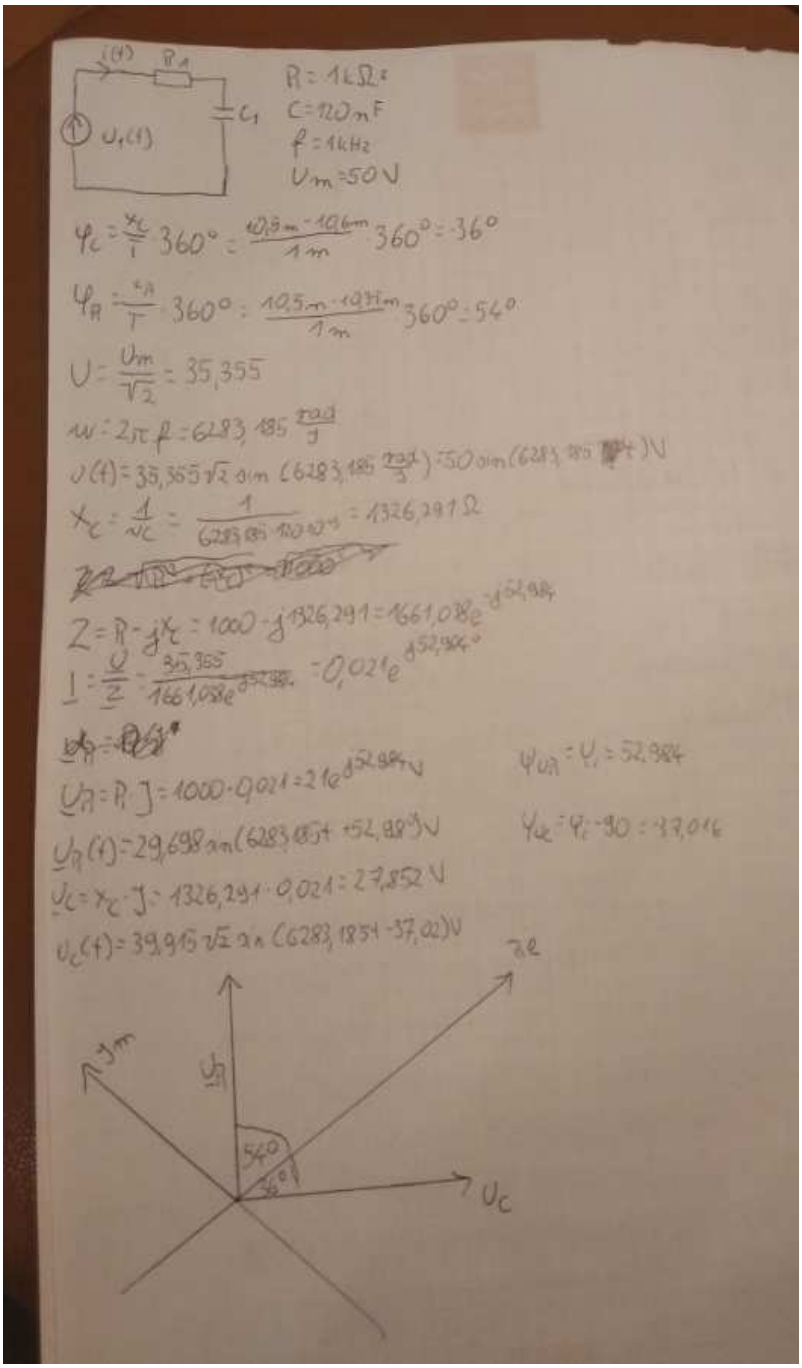
.INC "lab_3_2 (1).net"

**** INCLUDING "lab_3_2 (1).net" ****
* Schematics Netlist *

R_R1 $N_0002 $N_0001 1k

```
C_C1         0 $N_0001  120n
V_VU1         $N_0002 0
+SIN 0 50 1k 0 0 0

**** RESUMING "lab_3_2 (1).cir" ****
.INC "lab_3_2 (1).als"



**** INCLUDING "lab_3_2 (1).als" ****
* Schematics Aliases *

.ALIASES
R_R1           R1(1=$N_0002 2=$N_0001 )
C_C1           C1(1=0 2=$N_0001 )
V_VU1           VU1(+=$N_0002 -=0 )
.ENDALIASES


**** RESUMING "lab_3_2 (1).cir" ****
.probe


.END


 ****     OPERATING POINT INFORMATION      TEMPERATURE =
27.000 DEG C




         JOB CONCLUDED

         TOTAL JOB TIME            .02
```

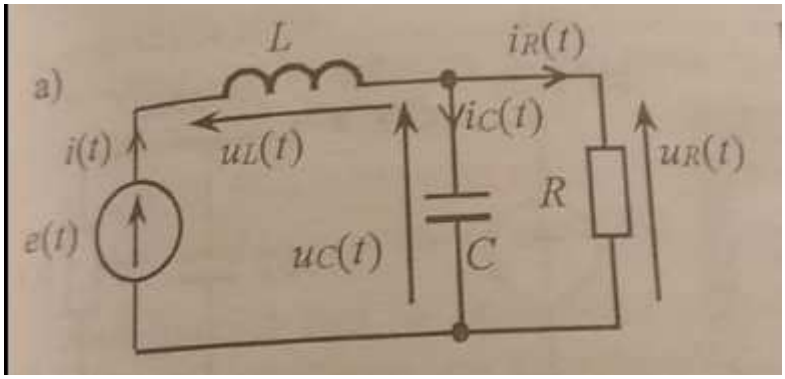
Obliczenia ręczne:

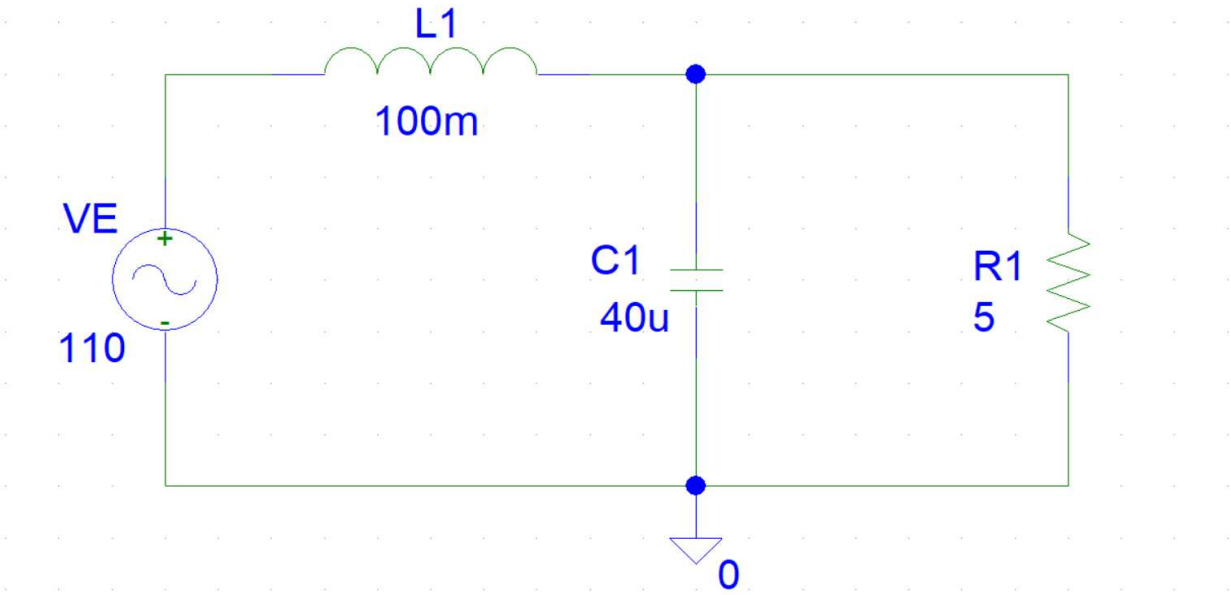


Wielkośc	Wyniki komputerowe	Wyniki ręczne
u(t)[V]	49,996sin(6283,185t)	50sin(6283,185t)
u_R(t)[V]	30,105sin(6283,185t+52,98)	29,698sin(6283,185t+52,98)
u_C(t)[V]	39,918sin(6283,185-37,02)	39,915sin(6283,185-37,02)

c)Wyznaczanie wartości prądów i napięć w obwodzie

Dane: L1=19,1mH, C1=40uF, R1=5Ohm





Obliczenia komputerowe:

**** 01/27/19 17:16:08 ********** Evaluation PSpice (Nov 1999) **********

* C:\Users\Norbert\Desktop\3 ois\lab_3_3.sch

**** CIRCUIT DESCRIPTION

****
****

```
* Schematics Version 9.1 - Web Update 1
* Sun Jan 27 17:14:51 2019



** Analysis setup **
.OPTIONS NOBIAS
.OPTIONS NOPAGE
.OP
.AC LIN 1 50 50
.PRINT AC VM(R_R1) VP(R_R1) VR(R_R1) VI(R_R1)
+VM(L_L1) VP(L_L1) VR(L_L1) VI(L_L1)
+VM(C_C1) VP(C_C1) VR(C_C1) VI(C_C1)
+IM(R_R1) IP(R_R1) IR(R_R1) II(R_R1)
+IM(L_L1) IP(L_L1) IR(L_L1) II(L_L1)
+IM(C_C1) IP(C_C1) IR(C_C1) II(C_C1)


* From [PSPICE NETLIST] section of pspiceev.ini:
.lib "nom.lib"

.INC "lab_3_3.net"

**** INCLUDING lab_3_3.net ****
* Schematics Netlist *



R_R1          $N_0001 0  5
C_C1          $N_0001 0  318u
L_L1          $N_0002 $N_0001  19.1m
V_VE          $N_0002 0  AC 219.9102 -90

**** RESUMING lab_3_3.cir ****
.INC "lab_3_3.als"
```

**** INCLUDING lab_3_3.als ****
* Schematics Aliases *

.ALIASES
R_R1 R1(1=$N_0001 2=0)
C_C1 C1(1=$N_0001 2=0)
L_L1 L1(1=$N_0002 2=$N_0001)
V_VE VE(+=$N_0002 -=0)
.ENDALIASES

**** RESUMING lab_3_3.cir ****
.probe

.END

**** OPERATING POINT INFORMATION TEMPERATURE = 27.000 DEG C

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VM(R_R1) VP(R_R1) VR(R_R1) VI(R_R1) VM(L_L1)

5.000E+01 1.738E+02 -1.615E+02 -1.649E+02 -5.503E+01

2.332E+02

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VP(L_L1) VR(L_L1) VI(L_L1) VM(C_C1) VP(C_C1)

5.000E+01 -4.500E+01 1.649E+02 -1.649E+02 1.738E+02 -1.615E+02

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ VR(C_C1) VI(C_C1) IM(R_R1) IP(R_R1) IR(R_R1)

5.000E+01 -1.649E+02 -5.503E+01 3.476E+01 -1.615E+02 -3.298E+01

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ II(R_R1) IM(L_L1) IP(L_L1) IR(L_L1) II(L_L1)

5.000E+01 -1.101E+01 3.886E+01 -1.350E+02 -2.748E+01 -2.748E+01

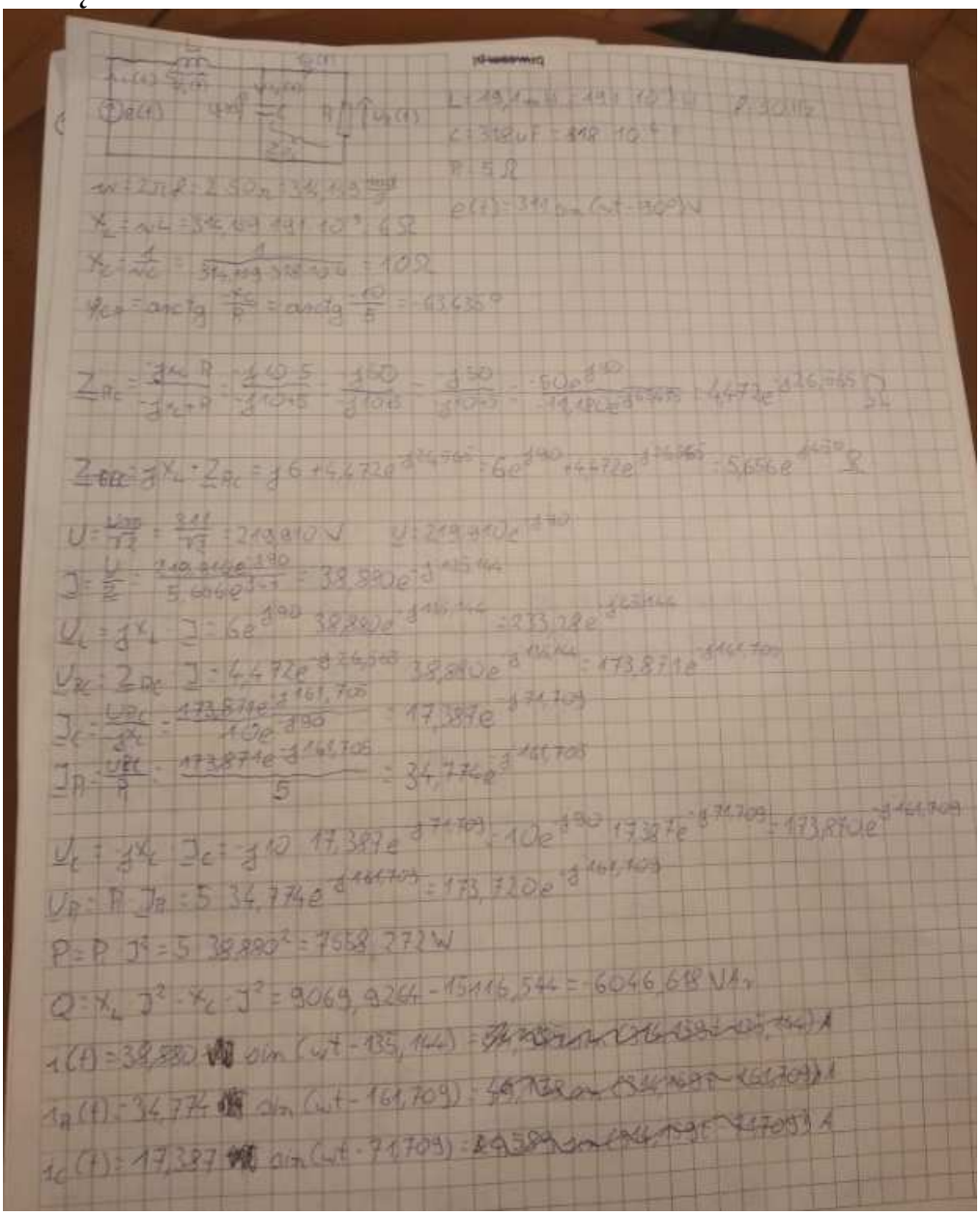
**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ	IM(C_C1)	IP(C_C1)	IR(C_C1)	II(C_C1)
5.000E+01	1.737E+01	-7.154E+01	5.498E+00	-1.647E+01

JOB CONCLUDED

TOTAL JOB TIME .02

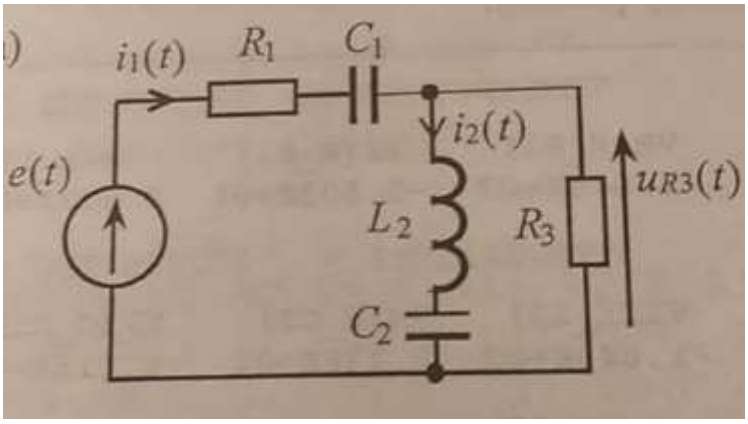
Obliczenia ręczne

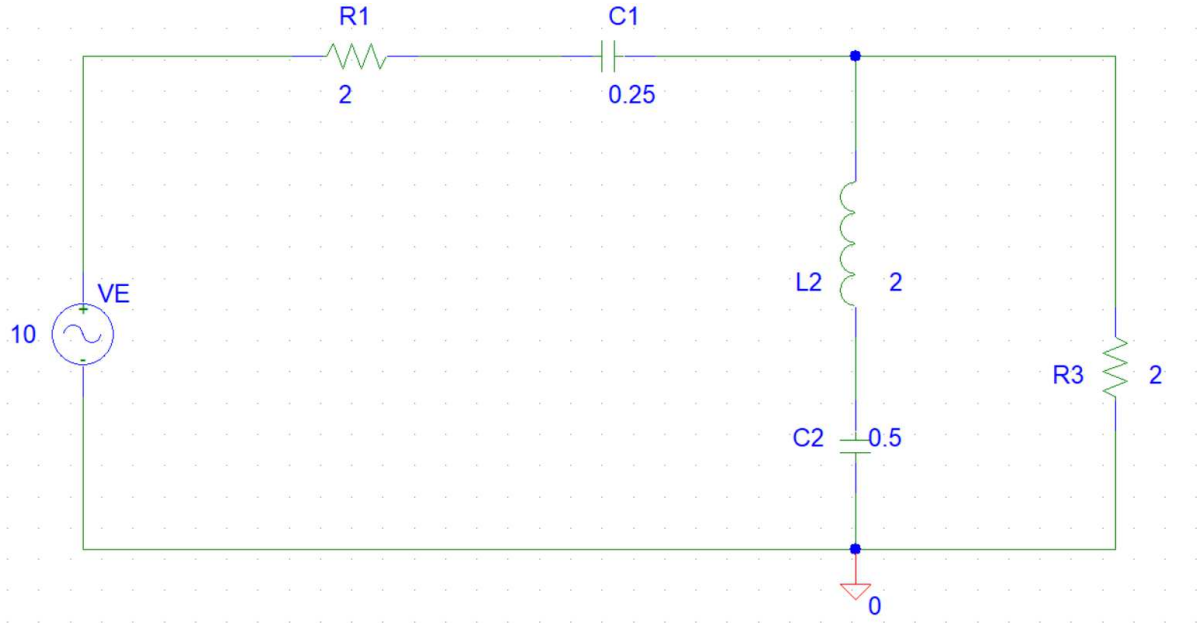


Wielkośc	Wynik komputerowy	Wynik ręczny
$\underline{I}$	$38,86e^{-j135}$	$38,880e^{-j135,144}$
$\underline{I}_{L1}$	$38,86e^{-j135}$	$38,880e^{-j135,144}$
$\underline{I}_{C1}$	$17,37e^{-j71,54}$	$17,387e^{-j71,709}$
$\underline{I}_{R1}$	$34,76e^{-j161,5}$	$34,774e^{-j161,705}$
$\underline{U}_{L1}$	$233,2e^{-j45}$	$233,28e^{-j45,144}$
$\underline{U}_{C1}$	$173,8e^{-j161,5}$	$173,871e^{-j161,709}$
$\underline{U}_{R1}$	$173,8e^{-j161,5}$	$173,871e^{-j161,709}$

d)Wyznaczanie wartości prądów i napięć w obwodzie

Dane: R1=2Ohm, C1=0,25F, L2=2H, C2=0,5F, R3=2Ohm





Obliczenia komputerowe

**** 01/27/19 17:56:13 ********** Evaluation PSpice (Nov 1999) **********

* C:\Users\Norbert\Desktop\3 ois\Schematic2.sch

**** CIRCUIT DESCRIPTION

****
****

* Schematics Version 9.1 - Web Update 1
* Sun Jan 27 17:55:14 2019

** Analysis setup **
.OPTIONS NOBIAS
.OPTIONS NOPAGE
.OP
.AC LIN 1 0.159155 0.159155
.PRINT AC IM(R_R1) IP(R_R1) IR(R_R1) II(R_R1)
+IM(L_L2) IP(L_L2) IR(L_L2) II(L_L2)
+VM(R_R3) VP(R_R3) VR(R_R3) VI(R_R3)

* From [PSPICE NETLIST] section of pspiceev.ini:
.lib "nom.lib"

.INC "Schematic2.net"

**** INCLUDING Schematic2.net ****
* Schematics Netlist *

R_R1 $N_0002 $N_0001 2
C_C1 $N_0001 $N_0003 0.25
L_L2 $N_0004 $N_0003 2
R_R3 0 $N_0003 2
C_C2 0 $N_0004 0.5
V_VE $N_0002 0 DC 0V AC 10 15

**** RESUMING Schematic2.cir ****
.INC "Schematic2.als"

**** INCLUDING Schematic2.als ****
* Schematics Aliases *

.ALIASES
R_R1 R1(1=$N_0002 2=$N_0001)
C_C1 C1(1=$N_0001 2=$N_0003)
L_L2 L2(1=$N_0004 2=$N_0003)
R_R3 R3(1=0 2=$N_0003)
C_C2 C2(1=0 2=$N_0004)
V_VE VE(+=$N_0002 -=0)
.ENDALIASES

**** RESUMING Schematic2.cir ****
.probe

.END

**** OPERATING POINT INFORMATION TEMPERATURE = 27.000 DEG C

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ IM(R_R1) IP(R_R1) IR(R_R1) II(R_R1) IM(L_L2)

1.592E-01 2.236E+00 7.843E+01 4.483E-01 2.191E+00 2.236E+00

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ IP(L_L2) IR(L_L2) II(L_L2) VM(R_R3) VP(R_R3)

1.592E-01 7.843E+01 4.483E-01 2.191E+00 3.198E-06 -1.157E+01

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

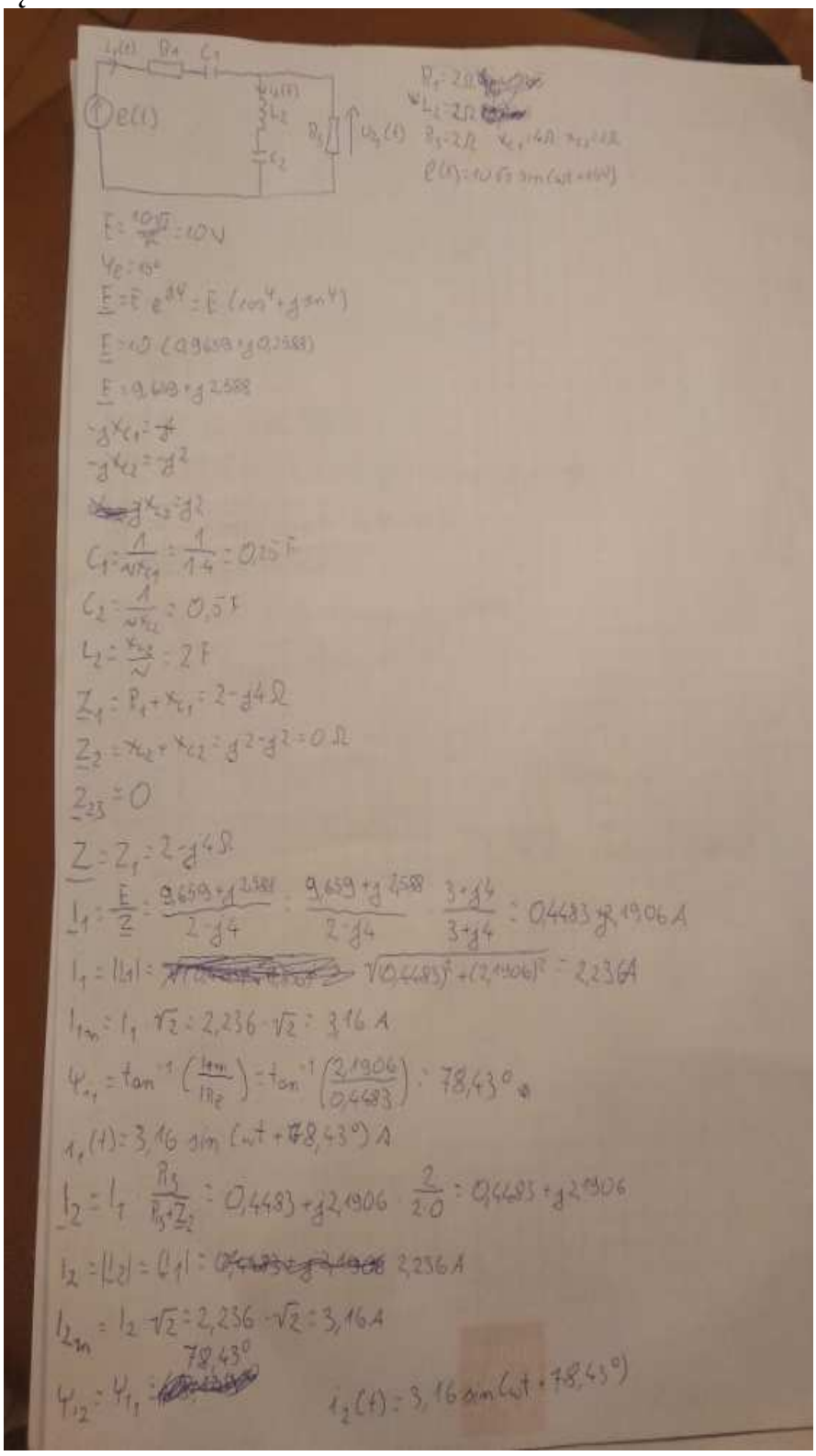
FREQ VR(R_R3) VI(R_R3)

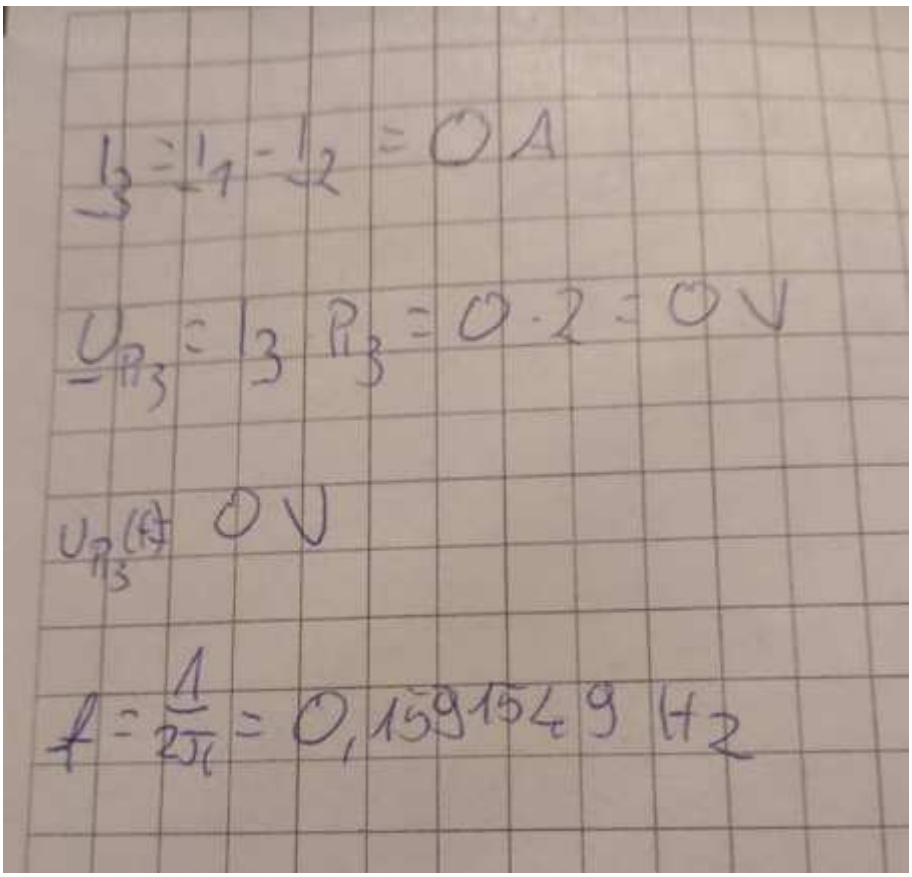
1.592E-01 3.133E-06 -6.412E-07

JOB CONCLUDED

TOTAL JOB TIME .02

Obliczenia ręczne:





Wielkośc	Wynik komputerowy	Wynik ręczny
$\underline{I}_1$[A]	0,448+j2,191	0,4483+j2,1906
$\underline{I}_2$[A]	0,448+j2,191	0,4483+j2,1906
$\underline{U}_{R3}$[V]	$3.133*10^{-6}$ $-j6.412*10^{-7}$ V	0
fr[Hz]	0,1591549	0,1591549
i_1(t)[A]	2,236pier2(wt+78,43)	3,16sin(wt+78,43)
i2(t)[A]	2,236pier2(wt+78,43)	3,13sin(wt+78,43)

Wnioski:

W tym ćwiczeniu badaliśmy obwodu prądu sinusoidalnie zmiennego.Wyniki obliczeń ręcznych w większości pokrywają się z obliczeniami komputerowymi. Wszelkie niedokładności są spowodowane przybliżeniami zastosowanymi w obliczeniach. We wszystkich ćwiczeniach postępowaliśmy zgodnie z instrukcjami zawartymi w książce co pozwoliło na precyzyjne pomiary oraz brak pomyłek. Dzięki programowi i możliwości wykonywania w nim wykresów upewniliśmy się że obliczenia ręczne były wykonane dokładnie.