Birzeit University

Physics Department

Physics 112 – Practical Exam

Student's Name:
Student's No. :

Sum. Semester 2010/2011
Duration: 30 minutes

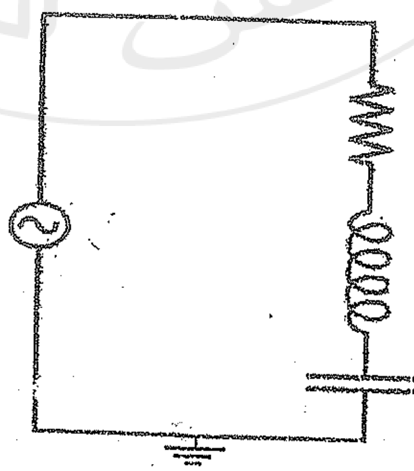
1. Connect the circuit shown and display V_R on the CRO screen (set $V_{in,p} = 1$ V, f = 1 KHz from the signal generator)

2. Measure the amplitude of V_R
   Answer: $V_{R,o} =$

3. Measure the frequency (f) of the input voltage V_{in} at which the amplitude of V_R is maximum (resonance frequency)
   Answer: f =

4. Measure the phase shift between V_L and V_R
   Answer: $\Phi =$

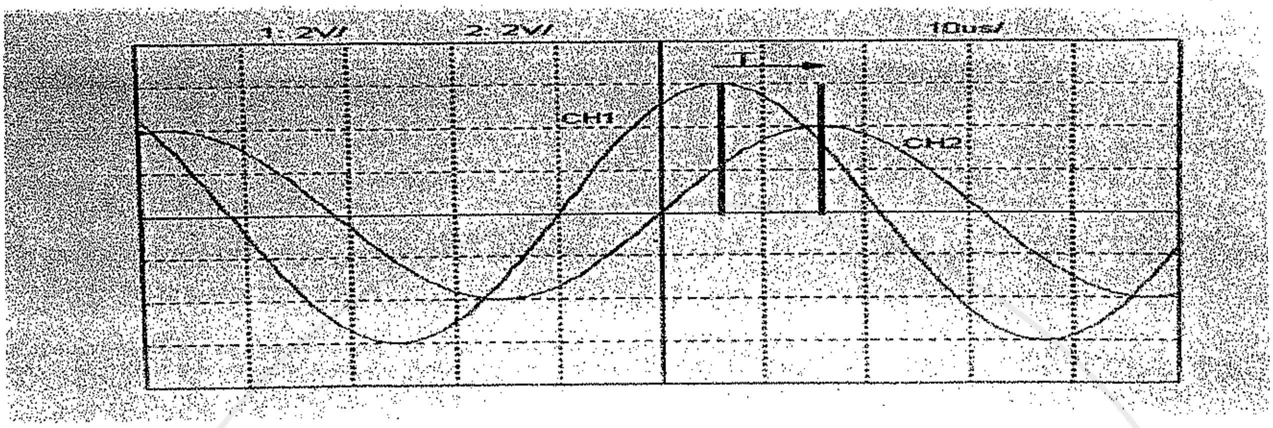
5. Remove L from the circuit (replace it by a short circuit). From V_R, measure ω_{-3dB} by changing the input frequency f
   Answer: $\omega_{-3dB} =$



To measure the phase shift between the two signals (R –Source)

$\Phi = 2\Pi f * \Delta t$

We find Δt from DSO like this:



3-measure the resonant frequency :(The current is maximum)

$\omega = \frac{1}{\sqrt{LC}}$ (I think the phase shift here must equal zero!!)

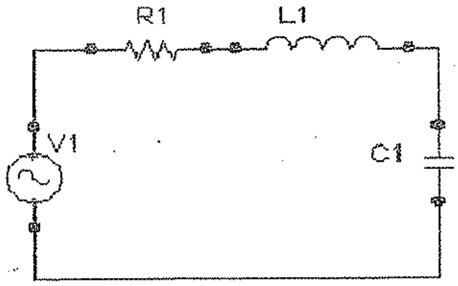
?

4- Measure the phase shift between the current (R) and the voltage on capacitor.

The ckt must be like this ….(and we must measure it at resonance ,because current inphase with ξ_{input}

So we measure voltage between source and capacitor at resonance and find the phase shift

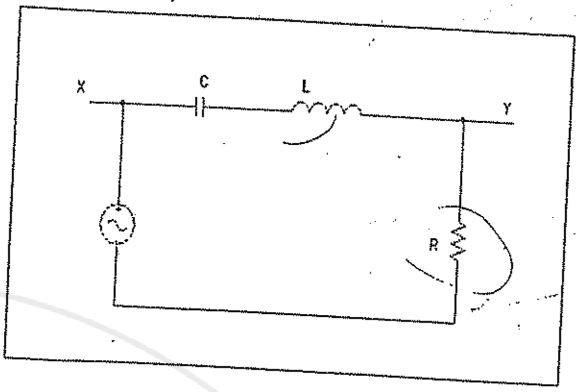
$\Phi = 2\Pi f * \Delta t$



Note: this is same for inductor (between source and inductor at resonance)

2) Set V_{in} = 2 (Volts) rms, f = 1.5KH. Using the curser find the amplitude of V_R.

3) Find the phase shift between the Vin and V_R using internal mode.



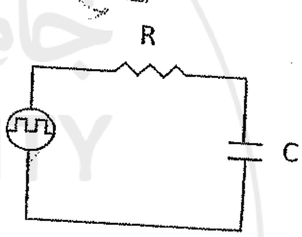
3) Find the resonant frequency f_0 experimentally, and at that frequency find the phase shift between V_{in} and V_L using external mode.

4) Remove L from the circuit and construct low pass filter. Find experimentally ω_{-3dB}.

5) Power the circuit from signal generator with a high frequency square wave what is the output?

Q5

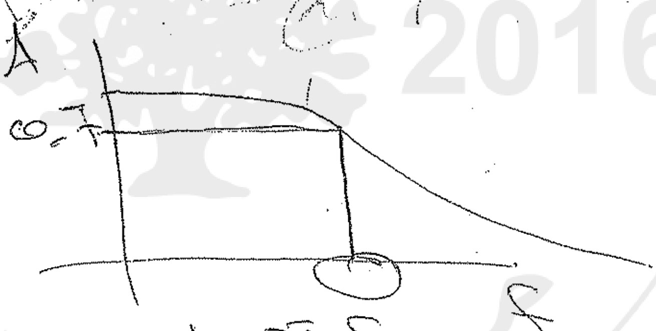
1. Connect the circuit shown((R=1KΩ, C=0.22μF)
2. Display V_R on the DSO and measure the time constant of the circuit.
3. Construct a high pass filter from this circuit. Show that this circuit works as differentiator at low frequency.
4. Measure ω_{-3dB}.



$A = \frac{V_{out}}{V_{in}}$

$0.7 = \frac{V_{out}}{V_{in}}$

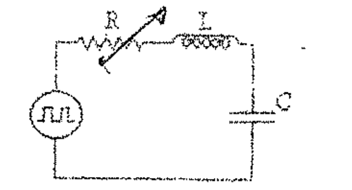
$V_{out} = 0.7 V_{in}$



$\omega = 2\pi f$

Q1:(RLC with square wave signal)

1- Connect the circuit shown

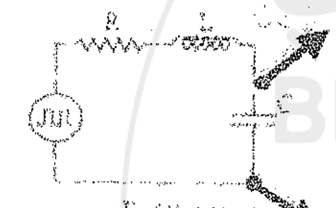


Fig(1)

Note: The signal for the source is square wave.

2- Show VC on the DSO screen (internal mode):

We connect the circuit as above, and connect channel1 with the capacitor like this:

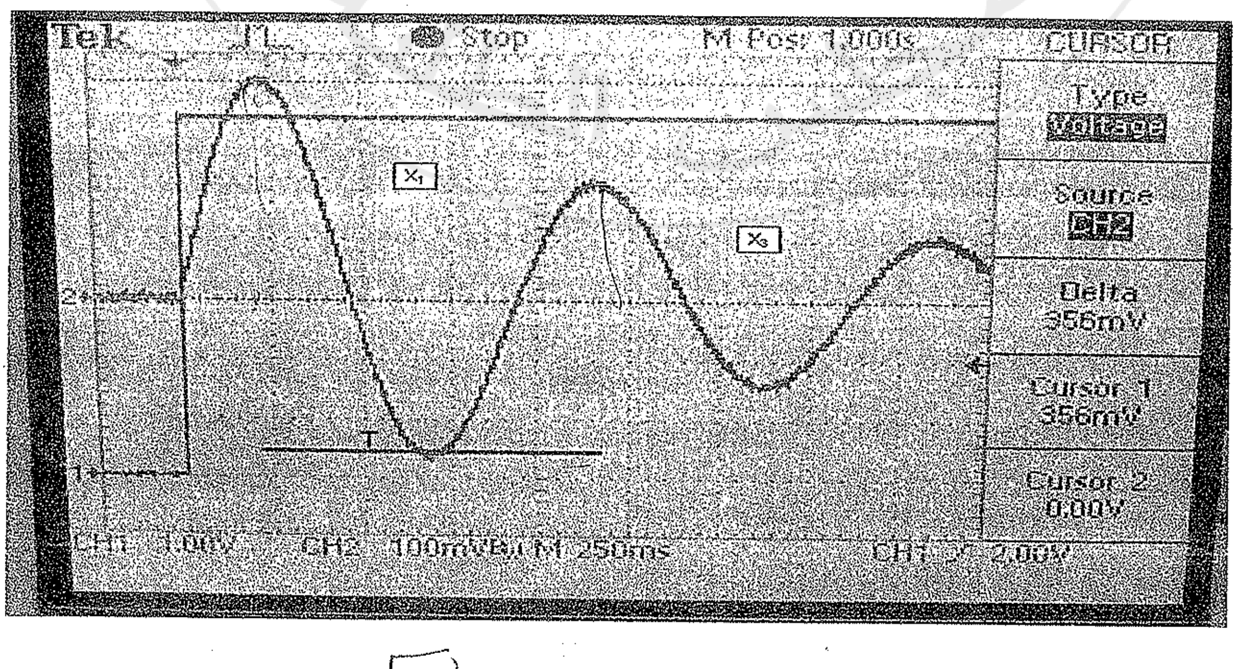


Fig(1)

3- Show the critical damping case:

First: we must find (Rckt : internal resistance):

- **We switch the variable resistance off and then from the screen shot of DSO , we find V1,V2 and Δt (period).**

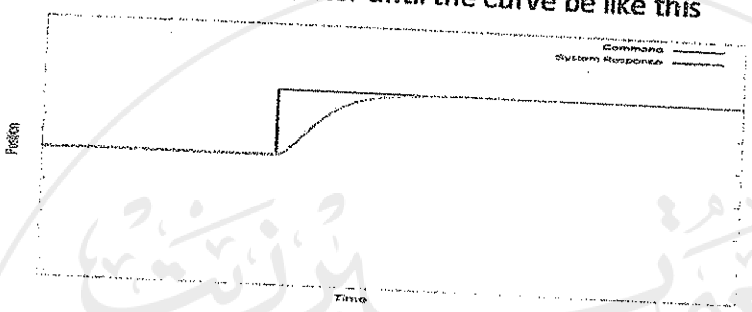


Substitute in the equation to find $\rho = (\ln \frac{V1}{V2}) / \Delta t$

And then find Rckt :

Rckt = $2l\rho$ (120 – 150) Ω

Then we find the R for critical damping case:
By changing the variable resistor until the curve be like this



For this case (L = 10mH ,C =0.01*10^-3)

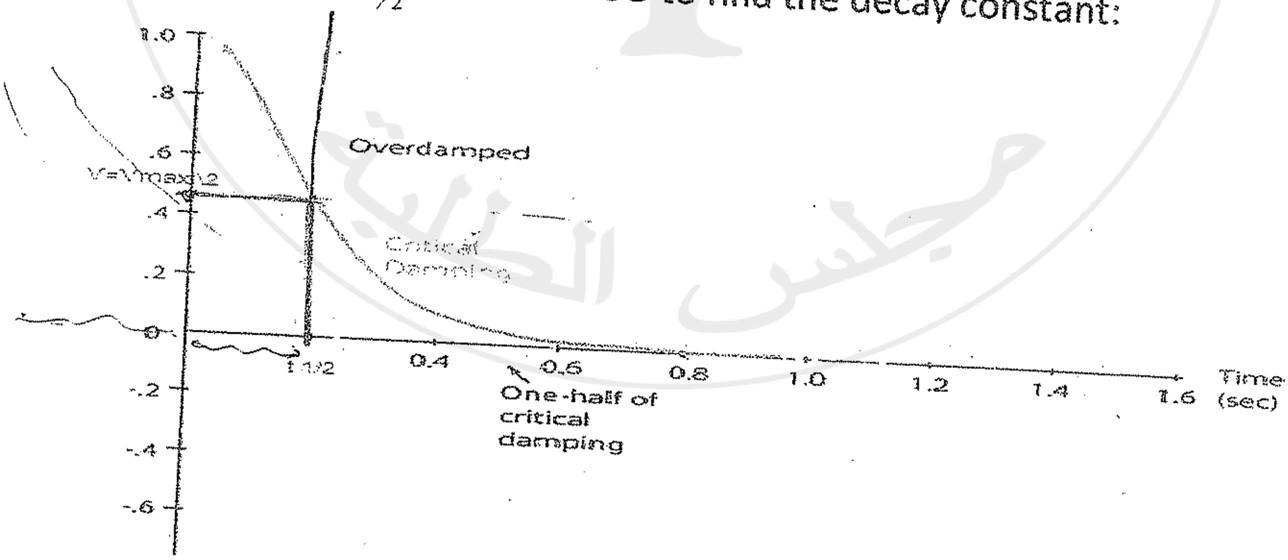
R (tho) = 2000 Ω

R(pra) = 2000-3000

4- Measure the decay constant in this case :(critical damping)

$t_{1/2} = \frac{\ln 2}{\lambda}$

So we must find $t_{1/2}$ from the DSO to find the decay constant:



$\lambda = \frac{\ln 2}{t_{1/2}}$ (This is valid for over damping and critical damping)

5- Show the under damping case:

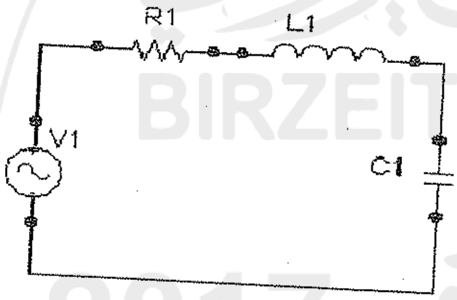
We make the value of variable resistor less than critical case (small enough)

6- Measure the oscillation frequency in this case (under Damping):

$f = \frac{1}{T}$ **(We find T from the DSO)**

Note: the frequency on (DSO is for source, not for under damping)

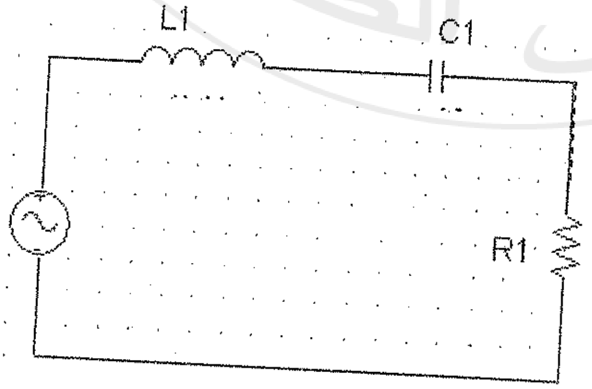
Q2: 1- Connect the circuit shown: (RLC with sinusoidal signal)



Note: the square wave here sinusoidal signal.

2- Measure the phase shift between the current (R) and the input voltage (f= 4KHZ).

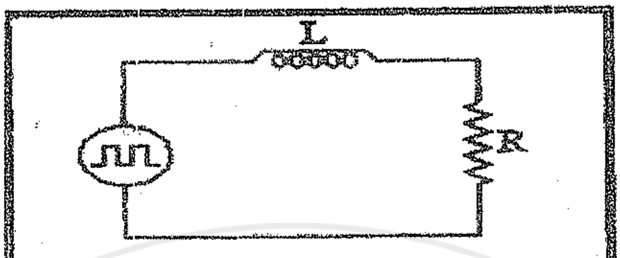
Notes: - here we must use two channels (the first on R and the second on the source) and to do this we must Replaces R in position of capacitor like this:



Then connect the two channels to the DSO (and will appear two signals)

Q3:

1- Connect the circuit as shown (R=1k ,L=10MH)



Fig(3)

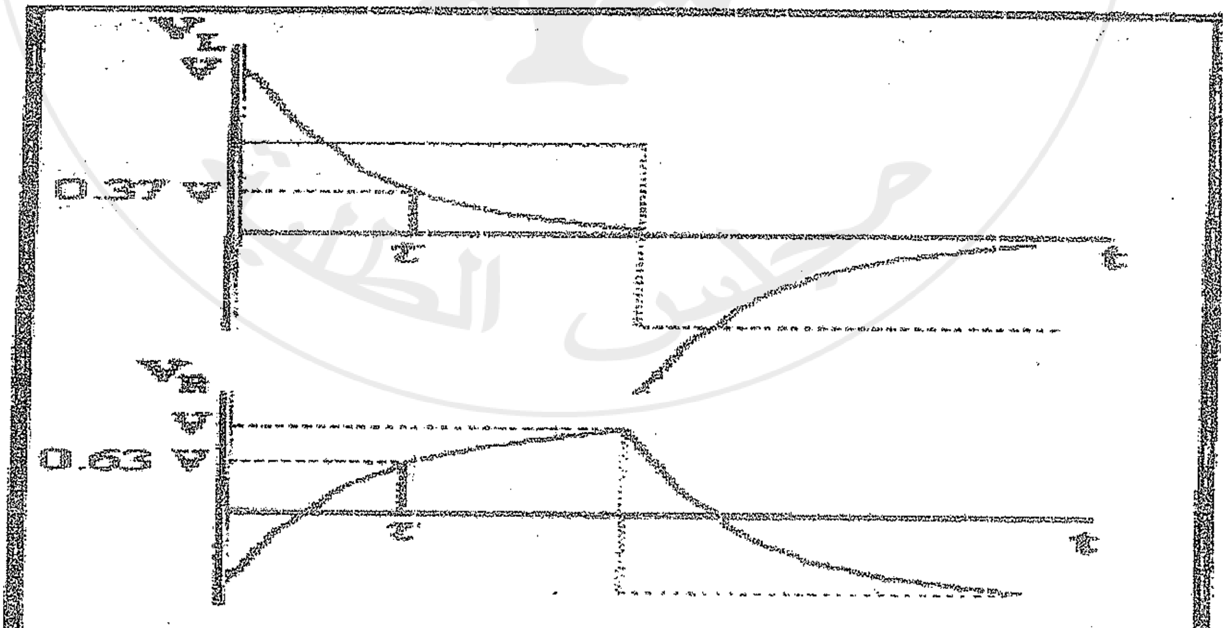
2- Show Vr on the DSO (internal mode)

We connect the circuit like this

Fig(3)

3- Measure the time constant τ of the circuit

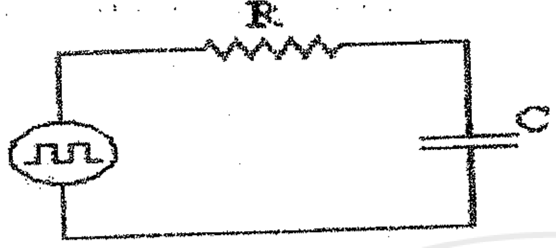
From the DSO ,we find time constant



Fig(4)

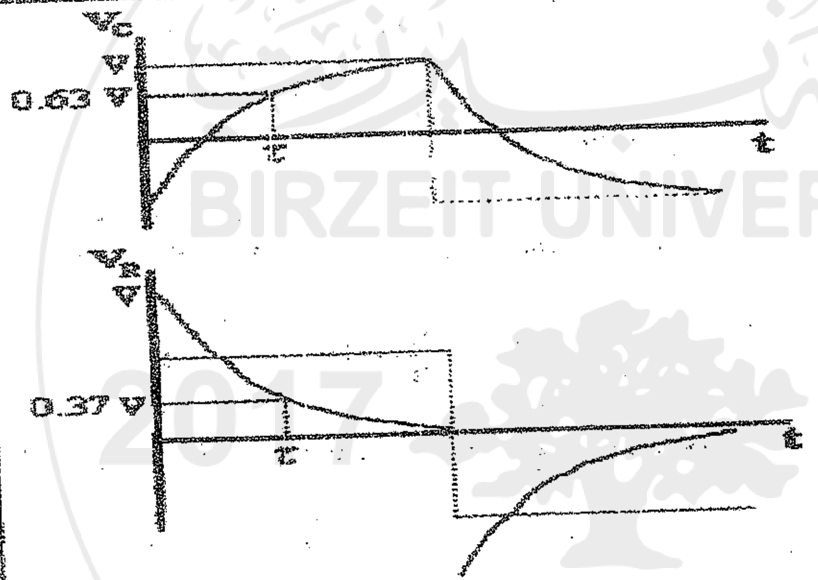
Q5:

1-connect the circuit as shown:



Fig(1)

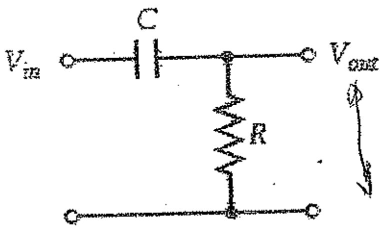
2-Display Vr on DSO and measure time constant :



Fig(2)

4- Construct a high pass filter from circuit ...show this circuit works as differentiator at low frequency .

The circuit must be like this..



Note: The supply must be (sinusoidal) not square wave

Not that here we can't draw (A vs. ω)

$A = \frac{Vout}{Vin}$ (here Vout : Vp-p for channal1 and Vin : Vp-p to channel2)

$0.707 = \frac{Vout}{Vin}$

V out = 0.707 Vin

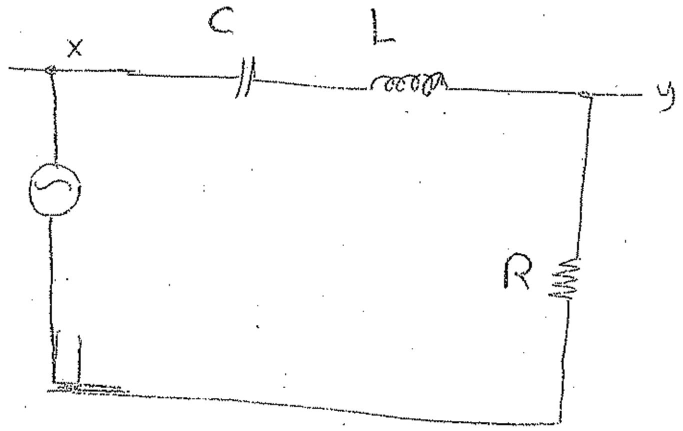
Ex: Vp-p =5 for signal1

Vp-p =2 for signal2

So Vout = 0.707 (5) = 3.5

We must change v2 to be 3.5

And then we find $\omega = 2\Pi f$



(1) set $V_{in} = 3V_{p\text{-}p}$ $f = 1KHz$. using the cursor find the amplitude V_R.

(2) Using internal mode find the phase shift between the drive voltage and V_R.

(3) Find experimently the resonance frequency

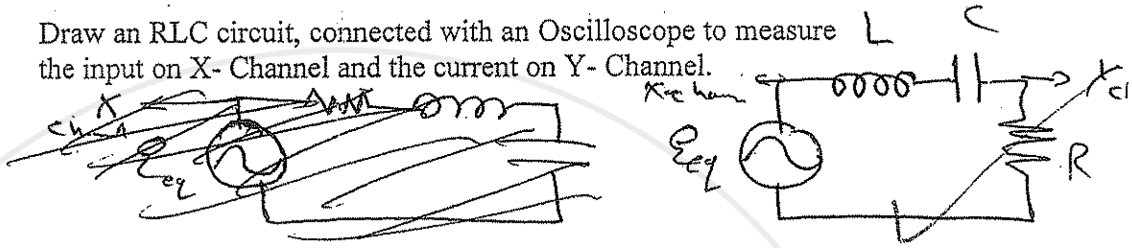
(4) Remove L, and set the frequency to 300Hz and set V_{in} to be triangular what is the output?.

بسم الله الرحمن الرحيم

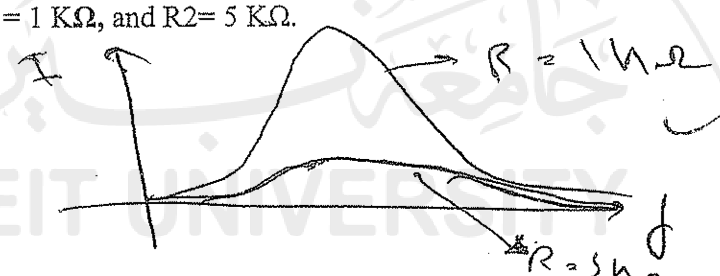
Birzeit University
Physics Department
Physics 112

Name: ……………………… **Student number:** ………………

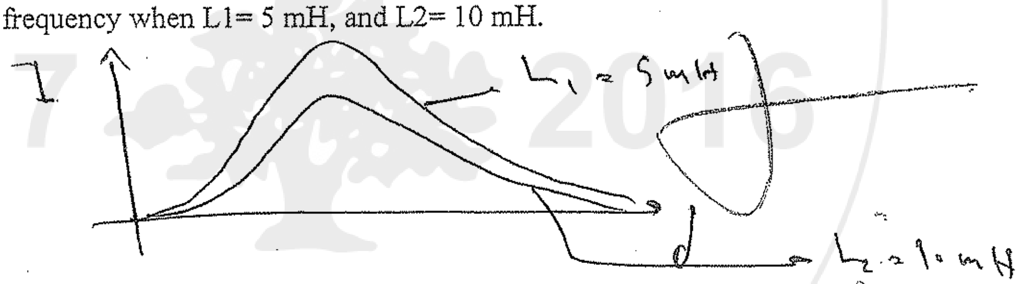
1. Draw an RLC circuit, connected with an Oscilloscope to measure the input on X- Channel and the current on Y- Channel.



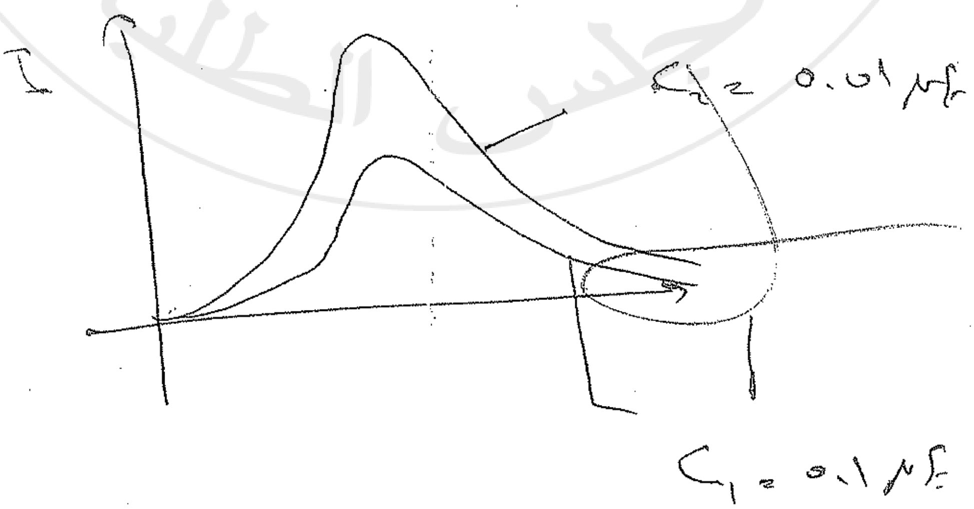
2. Draw a sketch of the relation between the current and frequency when R1= 1 KΩ, and R2= 5 KΩ.



3. Draw a sketch of the relation between the current and the frequency when L1= 5 mH, and L2= 10 mH.



4. Draw a sketch of the relation between the current and the frequency when C1= 0.1 μF, and C2= 0.01 μF.



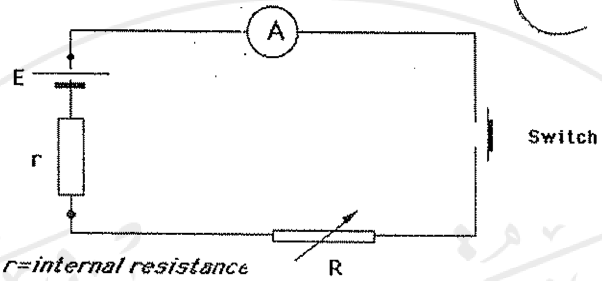
بسم الله الرحمن الرحيم

Birzeit University جامعة بيرزيت

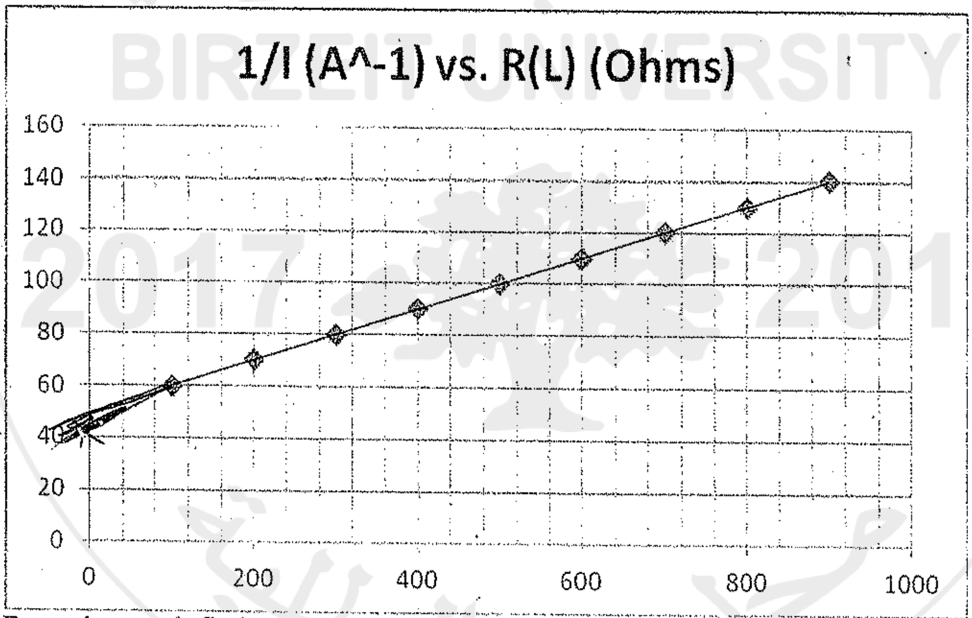
Physics Department دائرة الفيزياء

Experiment No. 2 (Internal Resistance)

Name: .... Student No.: ....



When the switch is on, changing R will change the current (I), then the result of drawing 1/I vs. the load resistance R_L is shown in the figures below,



From the graph find

The slope	Y- intercept	ε (volts)	R_{in} (Ω)
$\frac{140-60}{900-100}$ $\frac{1}{\varepsilon} = 0.1\ A^{-1}/\Omega$	$50\ A^{-1}$	$\frac{1}{\varepsilon} = 0.1$ $\varepsilon = 10\ V$	$\frac{R_{in}}{\varepsilon} = 50$ $R_{in} = 500\ \Omega$

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BIRZEIT UNIVERSITY

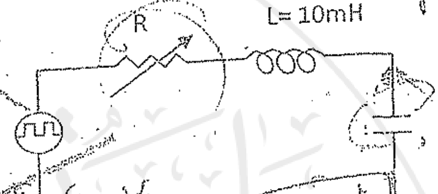
Physics Department

Physics 112

Practical Exam.

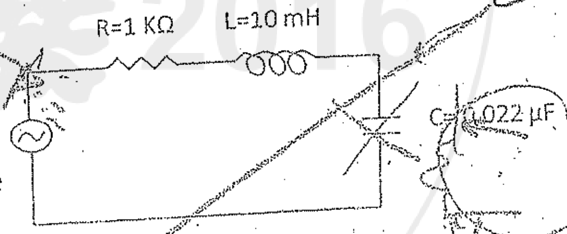
Your practical exam will be any of the following questions or any combination of them.

Q1:



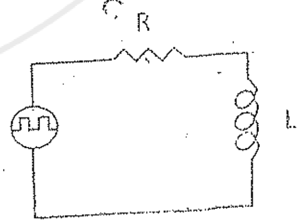
1) Connect the circuit shown.
2) Show V_c on the DSO screen (internal mode).
3) Show the critical damping case
4) Measure the decay constant in this case
5) Show the under damping case.
6) Measure the oscillation frequency in this case (ask instructor).

Q2:



1) Connect the circuit shown.
2) Measure the phase shift between the current and the input voltage at f=4 kHz.
3) Measure the resonant frequency.
4) Measure phase shift between the current and the voltage on the capacitor.

Q3:



1) Connect the circuit shown. (R=1 KΩ, L=10mH)
2) Show V_R on the Oscilloscope screen (internal mode).
3) Measure the time constant τ of the circuit.

Q4

1) Connect the following circuit (R=1KΩ, C=0.1µF, L=10mH).

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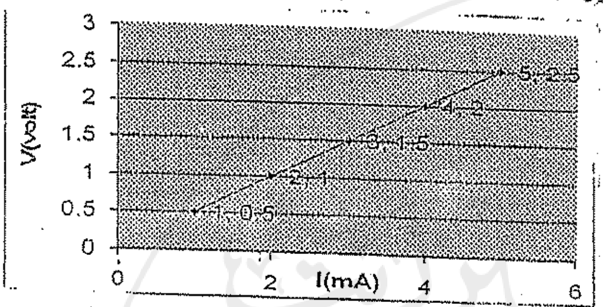
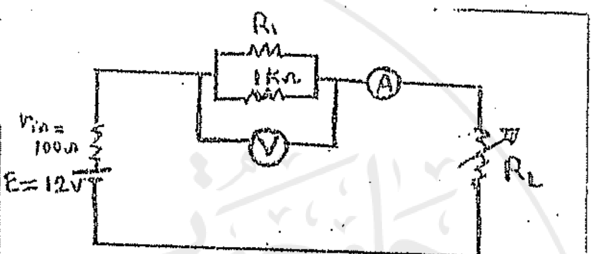
BIRZEIT UNIVERSITY

PHISICS DEPARTMENT
PHYSICS 112
QUIZ #1

For the following circuit the I-V characteristic curve was as shown :





1-What is the value of R1?

$R = \frac{\Delta V}{\Delta I} = \frac{2.5-0.5}{(5-1)10^{-3}} = 500\,\Omega \Rightarrow R = \frac{R_1 \times 1000}{R_1+1000} = 500$

2- What is the value of the load resistance that satisfies the maximum power transfer ?

$R_{eq} = R + r_{in}$ $\quad I = \frac{\varepsilon}{R_{eq}+R_L}$

$P = I^2 R = \frac{\varepsilon^2 R}{(R_{eq}+R_L)^2} = \frac{144 R}{R_{eq}+R_L}$

$= \frac{144 \times 500}{R_{eq}+R_L} = \frac{72{,}000}{R_{eq}+R_L}$

$\frac{dP}{dR_L} = 0 \Rightarrow$

R_{max}

$R_L = R_{eq} = R + r_{in}$

$R_L = 1.1\ k\Omega$

$500 R_1 + 500{,}000 = 1000 R$

$500 R_1 = 500{,}000$

$R_1 = \frac{500{,}000}{500}$

$= 1000\,\Omega$

$= 1\,k\Omega$

بسم الله الرحمن الرحيم

10

جامعة بيرزيت

Birzeit University

Physics Department

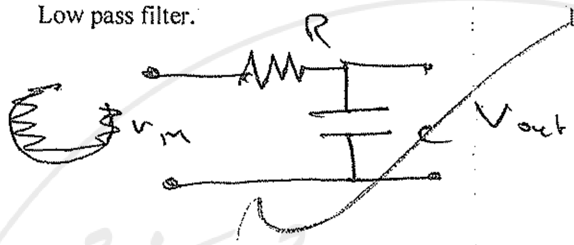
دائرة الفيزياء

Experiment No. 9 (Filters)

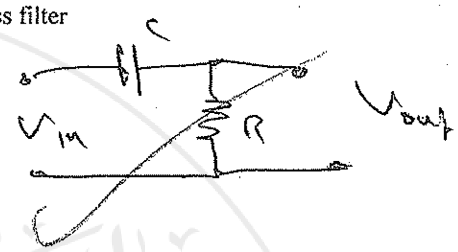
Name: ...[redacted]... Student No.: .....[redacted].......

1. Draw a RC circuit as a:

a) Low pass filter.

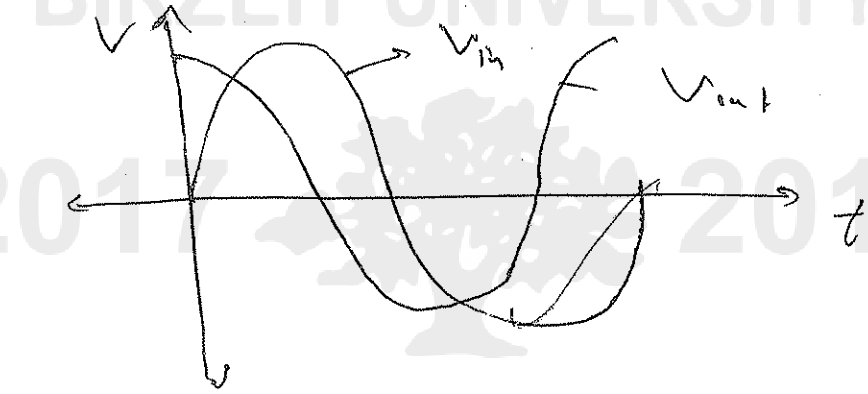


b) High pass filter

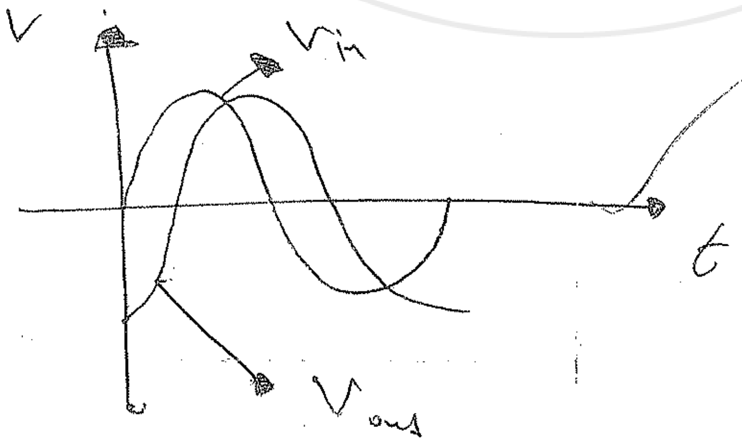


2. Which kind of filter is considered to be a differentiator? And which kind is considered as an integrator? How?

High → differentiator



Low → integrator



بسم الله الرحمن الرحيم

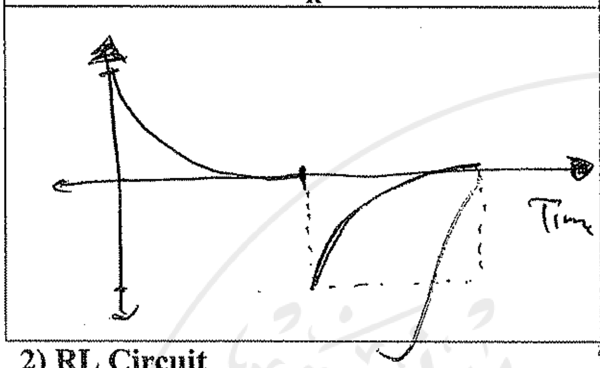
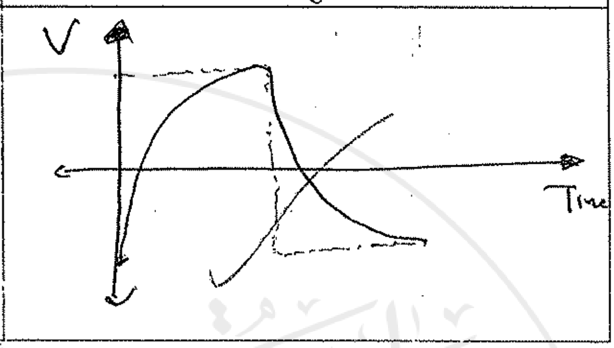
10

112 Lab Report
Experiment 7 (Capacitors and inductors)

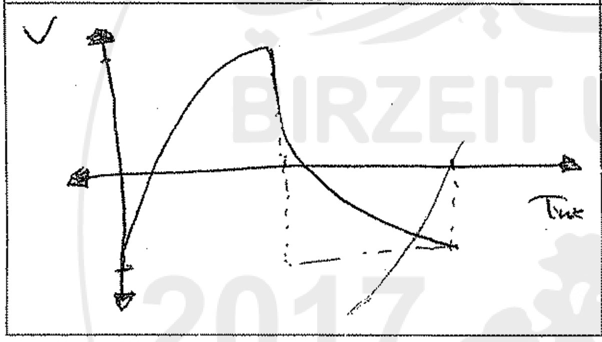
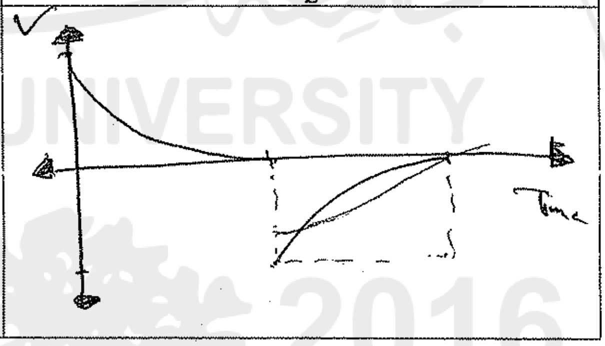
Student Name: [illegible] **Student No.:** [illegible]

If V_{in} is a full square wave ⊓⊔, draw, V_R, V_C, V_L in the following circuits

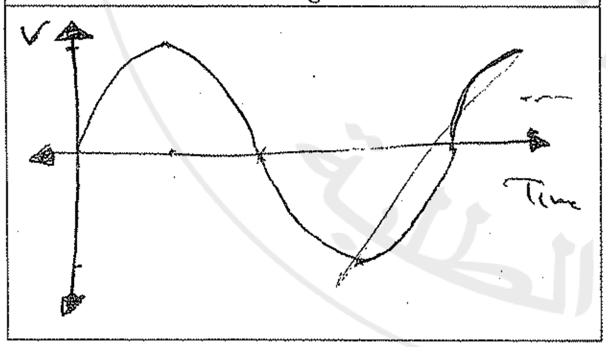
1) RC circuit

V_R	V_C
	

2) RL Circuit

V_R	V_L
	

3) LC Circuit

V_C


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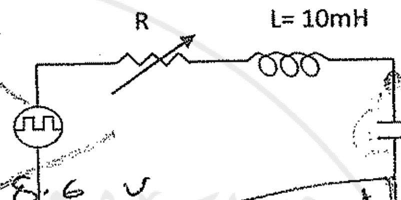
Physics 112

Practical Exam.

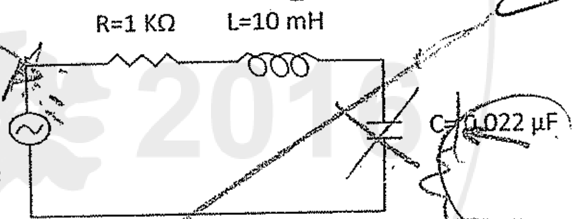
Your practical exam will be any of the following questions or any combination of them.

Q1:



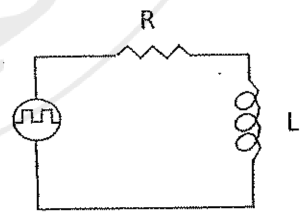
1) Connect the circuit shown.
2) Show V_c on the DSO screen (internal mode).
3) Show the critical damping case
4) Measure the decay constant in this case
5) Show the under damping case.
6) Measure the oscillation frequency in this case (ask instructor).

Q2:



1) Connect the circuit shown.
2) Measure the phase shift between the current and the input voltage at f=4 kHz.
3) Measure the resonant frequency.
4) Measure phase shift between the current and the voltage on the capacitor.

Q3:



1) Connect the circuit shown. (R=1 KΩ, L=10mH)
2) Show V_R on the Oscilloscope screen (internal mode).
3) Measure the time constant τ of the circuit.

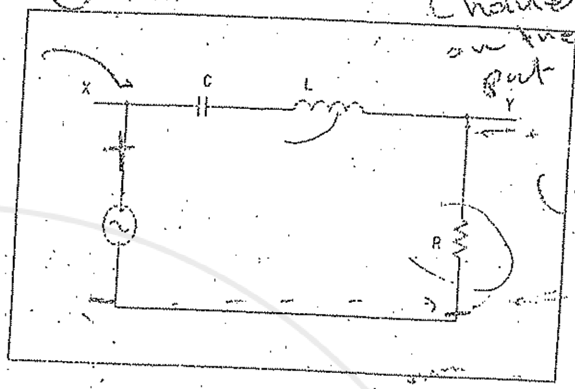
Q4

1) Connect the following circuit (R=1KΩ, C=0.1µF, L=10mH).

2) Set V_{in} = 2 (Volts) rms, f = 1.5KH. Using the curser find the amplitude of V_R. $V_p = \frac{V_{p-p}}{2}$

3) Find the phase shift between the Vin and V_R using internal mode.

3) Find the resonant frequency f_0 experimentally, and at that frequency find the phase shift between V_{in} and V_L using external mode.

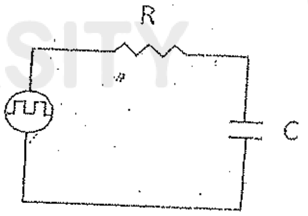


4) Remove L from the circuit and construct low pass filter. Find experimentally ω_{-3dB}.

5) Power the circuit from signal generator with a high frequency square wave what is the output?

Q5

1. Connect the circuit shown((R=1KΩ, C=0.22μF)
2. Display V_R on the DSO and measure the time constant of the circuit.
3. Construct a high pass filter from this circuit. Show that this circuit works as differentiator at low frequency.
4. Measure ω_{-3dB}.



$\phi = \omega \Delta t$

$= 2\pi f \Delta t$

$= 2\pi\, 1.5 \times 10^3 \times 76 \times 10^{-6}$

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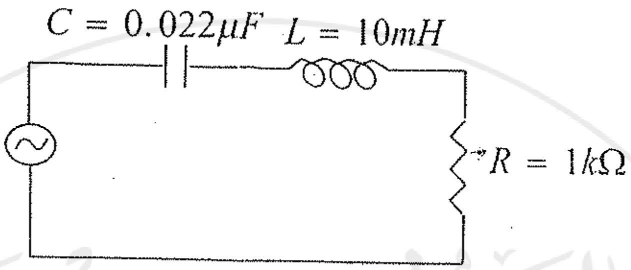
BIRZEIT UNIVERSITY

Physics Department

Physics 112

Practical Exam.

Name: [illegible] st.# [illegible]



1) Connect the circuit shown.
2) Set V_{in} = 1 (Volts) rms, f = 6 KHz.
   Using the curser find the amplitude of V_R and its frequency. 520 mV
3) Remove L from the circuit. Power the circuit from signal generator with square wave.
4) Display V_R on the DSO and measure the time constant of the circuit.
5) Construct a high pass filter from this circuit. Measure ω_{-3dB}.

diff

charging

constant

2.60 * 0.63

= 1.6

~~2.48 * 0.63~~

~~= 1.56~~

$\tau = 22\mu s$

$A = \frac{V_{out}}{V_{in}}$

0.7 =

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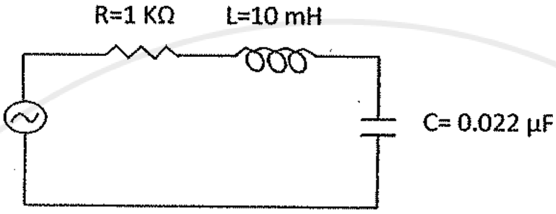
Physics Department

Physics 112

Practical Exam. V2

Name: ________________ st.# ________________



1) Connect the circuit shown.
2) Display V_R on the DSO screen. Measure the phase shift between the current and the input voltage at f=4 kHz. → $\Delta t = 60\ \mu s \Rightarrow \phi = 2\pi f \Delta t = 2\pi \times 4 \times 10^3 \times 60 \times 10^{-6} = 1.507$
3) Measure the resonant frequency.
4) Remove C from the circuit. Power the circuit from signal generator with a square wave.
5) Display V_R on the DSO screen. Measure the time constant of this RL circuit.

(2) $\phi = 2\pi F \Delta t$

$= 2\pi \times 4 \times 10^3 \times 60 \times 10^{-6}$

$\phi = 1.505$

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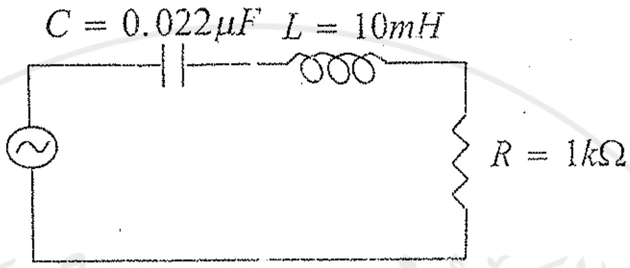
BIRZEIT UNIVERSITY
Physics Department
Physics 112

Practical Exam. V4

Name: Noor Abdallah st.# 1120176



1) Connect the circuit shown.
2) Set V_{in} = 1 (Volts) rms, f = 6 KHz.
   Using the curser find the amplitude of V_R and its frequency.
3) Remove L from the circuit. Power the circuit from signal generator with square wave.
4) Display V_R on the DSO and measure the time constant of the circuit.
5) Construct a high pass filter from this circuit. Measure ω_{-3dB}.

plock

BIRZEIT UNIVERSITY
PHYSICS DEPARTMENT

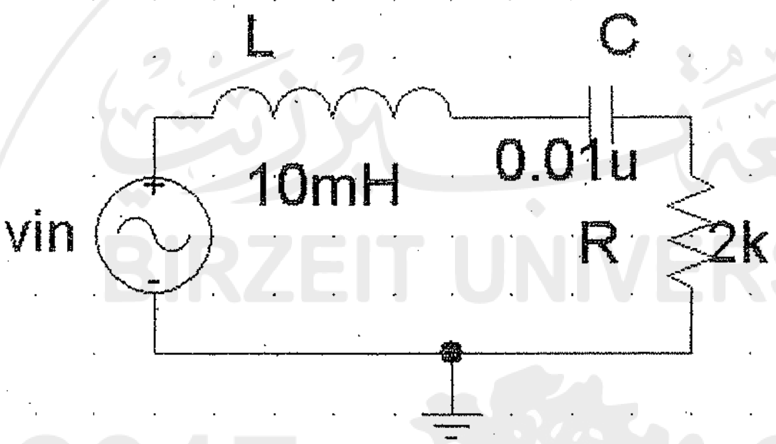
Practical Exam PHYSICS 112 Summer 2011

Instructor : Dr. E. Sader

Student Name-[redacted] St. No.[redacted]

Please call the instructor for inspection for each part you completed.

1-Connect an AC- series RLC circuit with R=2 KΩ, L= 10 mH and C=0.01 μF. Set the peak voltage of the signal generator at 3 Volts.



2- Measure the current in this circuit (rms and peak values), and the phase shift between this current and the sinusoidal driving voltage of the function generator at f=5 KHz.

3- Measure the resonance frequency f_o .

4- Measure the current flowing in this circuit for the resonance frequency (rms and peak values).

5 – Measure the voltages at resonance on the capacitor and inductor.

6-Add the measured peak voltages on the three components (show how you do it). Compare with the peak voltage of the function generator. Interpret your result.

Voltage = Capacitor =
Inductor =
I_o

$V_p = 3V$

GOOD LUCK

$R = \frac{V}{I}$

ϕ = a = 1
b = 1.3

phase shift = 50.3
resonance freq = 16.16 KHz

$I = \frac{V}{R}$

rms

$I = \frac{V}{R} = V_{rms}$ $\frac{1.95}{2k\Omega} = 975$ peak value

$R = \frac{V}{I}$

$I = \frac{3}{2k\Omega} = 1.5 \times 10^{-3}$

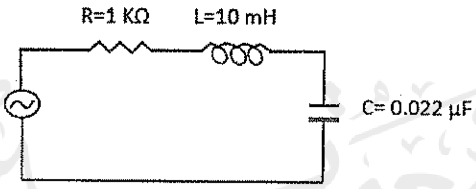
BIRZEIT UNIVERSITY

Physics Department

Physics 112

Practical Exam. V2

Name:__________________ st.# ____________________



1) Connect the circuit shown.
2) Display V_{in} 4 Volts, 4 KHz and measure V_R.
3) Display V_R on the DSO screen. Measure the phase shift between V_R and the input voltage at f=4 kHz.
4) Measure the resonant frequency.
5) Remove L from the circuit and construct a low pass filter. Power the circuit from signal generator with a square wave at 30 kHz. What is the output.