Centre Universitaire de Mila

Institut des sciences et technologie **Option :** ***Electromécanique***

Nom et Prénoms			*Groupe*	*Note*
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Date:.............................. *Horaire:*.............................. *Lab. N°*..........				

TP :3 Double alternating rectification and filtering

I. Objectifs:

1. Study of double-alternating recovery.
2. Study of capacitive filtering.

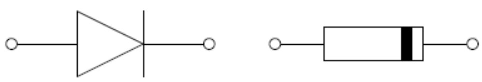
II. Equipment used : The following equipment is required for this practical assignment: :

- A stabilized power supply.
- Two digital multimeters.
- Connection cables and probes.
- Resistors **1kΩ** .
- An oscilloscope.
- Four rectifier diodes.
- Two capacitors of 100µF et 1000µF.

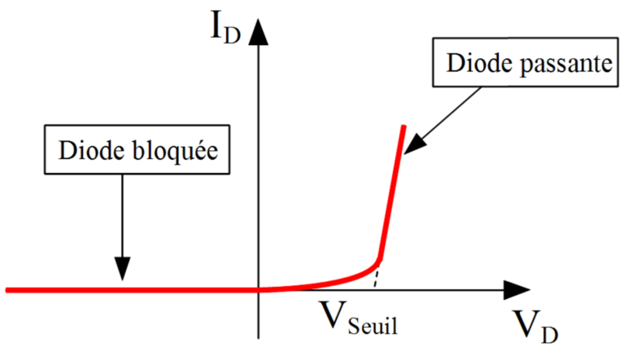
III. Complément théorique :

III.1) Définition :

A diode is **a nonlinear, polarized (or asymmetrical) dipole**. A diode consists of a PN junction, in which current flows from the p-type material (anode) to the n-type material (cathode). The diode is the basic **semiconductor component**. Its operation is similar to that of a switch (which only allows current to flow in one direction) controlled by voltage.



La caractéristique typique d'une diode a l'allure représentée sur le schéma suivant :



$r_d = \frac{\Delta V}{\Delta I}$ (r_d: dynamic resistance)

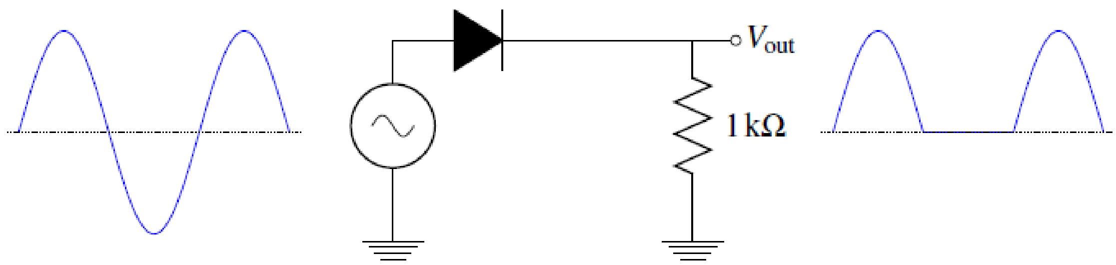
III.2) Applications:

One of the main applications of diodes is to transform an alternating signal, in which the direction of electron flow reverses every half-cycle, into a signal in which electrons flow in one direction only.

Given:

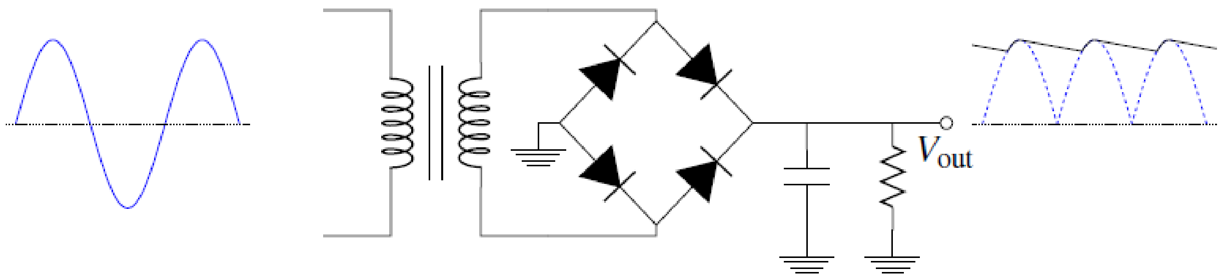
$V_0(V_{moy}) = \frac{1}{T}\int_0^T V\ (t)dt$, $V_{eff}^2 = \frac{1}{T}\int_0^T V^2\ (t)dt$, $f=\frac{1}{T}$, $\omega = 2\pi f$, $\theta=\omega t$

III.2.1) Redressement simple alternance:



- $V_0=\frac{1}{2\pi}\int_0^{2\pi} sin\ (\theta)d\theta$

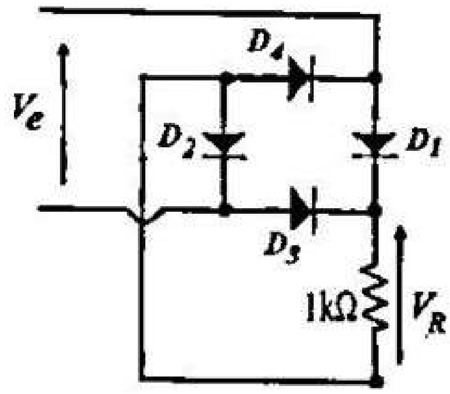
III.2.2) Redressement double alternance et filtrage:



-Le taux d'ondulation: $\frac{\Delta V}{V_m} \approx \frac{1}{2RCf}$, $V_0 = V_m - \frac{\Delta v}{2}$. $(V_m=V_{max})$

IV) Experimental Study

1. Full-Wave Rectification



- Set up the circuit shown in the following figure:
- Observe the voltage VR(t) on the oscilloscope. Record the following values:

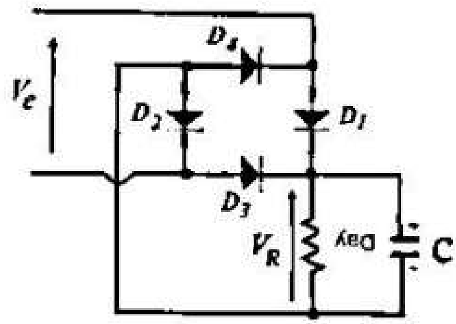
- The maximum value of Va(t): V =
- The period of Ve(t): T =

- Qualitatively reproduce the observed Va(t) curve on graph paper.
- Using a digital multimeter, measure:

- The average value of Va(t) (DC mode) V_0 =

2. Capacitive Filtering

- Set up the circuit shown in the following figure:



4.1. For C100 µF

- Observe the voltage VR(t) on the oscilloscope. Record the following values:

- The maximum value of VR(t): V_m =
- The period of VR(t): T =
- The ripple: ΔV =

- Qualitativelv reproduce the observed curve Va(t) on graph paper.
- Using the digital multimeter, measure:

- The average value of VR(t) (DC mode) V_0 =

4.2. For C 1000 µF

- Observe the vᐧltage VR(t) on the oscilloscope. Record the following values:

- The maximum value of Va(t): V =
- The period of Va(t): T =

- Ripple: $\Delta V =$

➤ Qualitatively reproduce the observed curve Va(t) on graph paper.

➤ Using the digital multimeter, measure:

The average value VR(t) (DC mode) Vo =

V. Calculation of the different parameters of the circuit from the previous steps.

- Using the measurements taken and the recorded values:

1. Full-wave rectification

➤ Calculate:

- The RMS value, average value, and frequency of Va(t).

$V_{eff} =$ $V_0 =$ f =

- Compare these calculated values with those measured with the multimeter and with the given frequency (of Ve(t)).

2. Capacitive filtering

➤ Calculate:

- The ripple factor and the average value of Va(t) for C = 100µF.

$\frac{\Delta V}{V_m} =$ Vo =

- The ripple rate and the average value of Va(t) for C = 1000µF

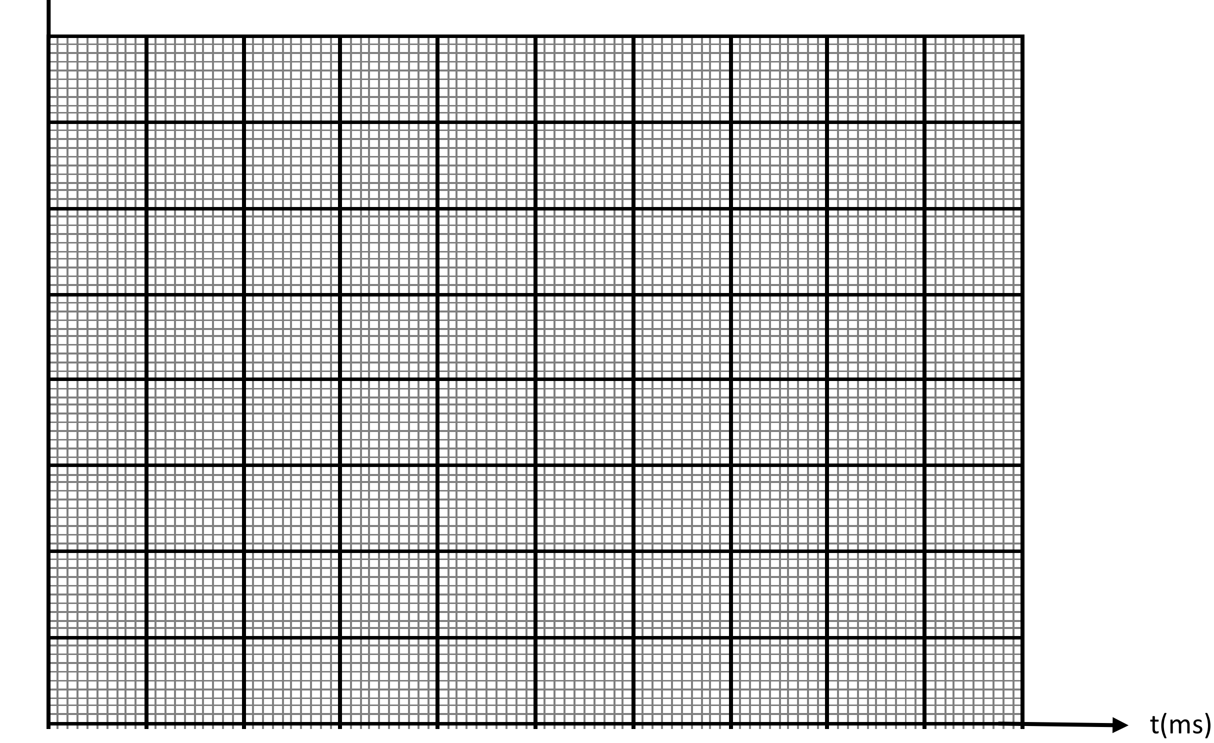
$\frac{\Delta V}{V} =$ Vo =

- Compare the calculated values of V with those measured with the multimeter.

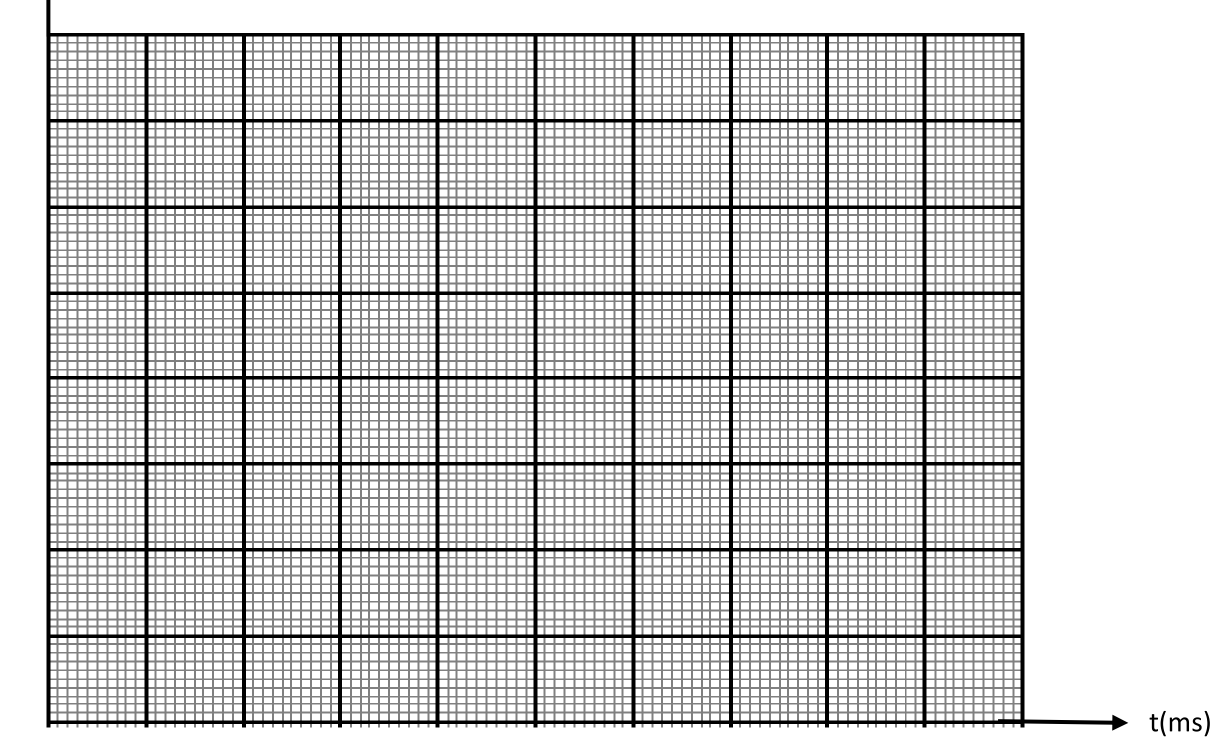
VI. *Conclusion*

- Draw a suitable conclusion regarding this lab

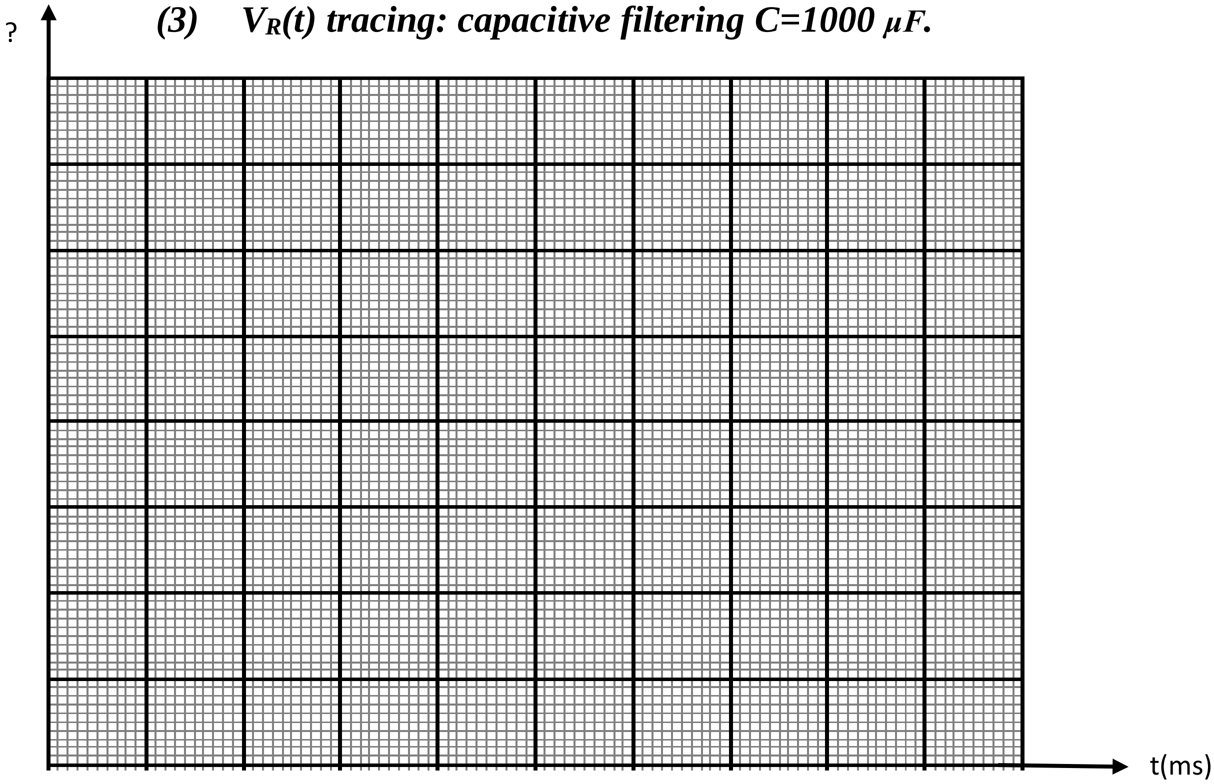
(1) $V_R(t)$ tracing: double alternating rectification.



(2) $V_R(t)$ tracing: capacitive filtering C=100 μF.



(3) $V_R(t)$ tracing: capacitive filtering C=1000 μF.



VI) Comparison between theoretical and practical results

VII) Conclusion: draw an appropriate conclusion about this practical assignment.