

# Exp.4: Half Wave Rectifier

## 1-Objectives:

- To calculate and draw the DC output voltages of half-wave rectifiers.
- Without smoothing capacitor and with smoothing capacitor.

## 2-Circuit elements:

### Instruments

AC power supply or Function Generator

2 Voltmeters

Function Generator

Oscilloscope

### Components

Diode: Silicon D1N4007

Resistors: 10 k $\Omega$ ,

Capacitor :( 0.47  $\mu$ F)

Capacitor :( 4.7  $\mu$ F)

Electrolytic Capacitor 100  $\mu$ F

## 3-Circuit Diagram:

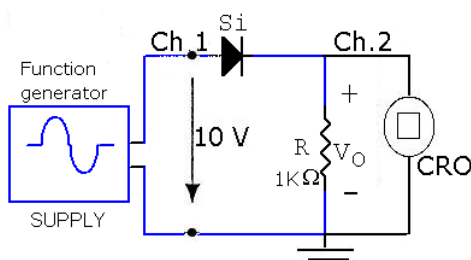


Fig.1

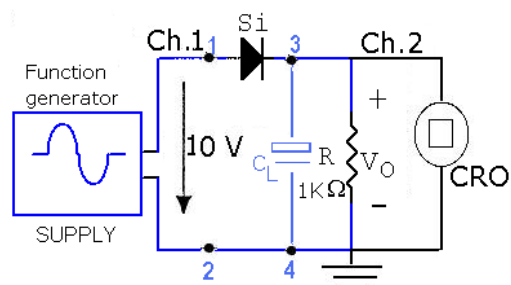


Fig.2

#### **4-Procedure:**

1. Connect the circuit as shown in Fig.1, adjust the power supply at 10 V.
2. Measure the input voltage  $V_1$  and the output voltage  $V_2$  using both the voltmeter and the oscilloscope.

	V (input) (Volt)	V (output) (Volt)
With voltmeter	10 V a.c	V d.c
With oscilloscope	Vp-p	VP-P

3. Draw the input waveform,  $V_i$ , and the output waveform,  $V_o$ .
4. Calculate: 1) Maximum voltage of the input signal

$$V_m = \frac{V_{p-p}}{2}$$

- 2) the effective value of the input voltage

$$V = \frac{V_m}{\sqrt{2}}$$

- 3) the average value of the output voltage

$$V_{av} = V_{dc} = 0.318V_m$$

5. Comment on the results you obtained.

#### **Smoothing and filtering**

6. Connect the circuit as shown in Fig.2.
7. Measure  $V_{out}$  with voltmeter as a function of the capacitance value of the smoothing capacitor  $C_L=0.47\mu\text{F}$ ,  $4.7\mu\text{F}$ ,  $100\mu\text{F}$  and at the same time measure the ripple voltage  $V_{P-P}$  using C.R.O.

$C_L$ ( $\mu\text{F}$ )	$V_o$ (voltmeter) ( Volts )	$V_{p-p}$ (CRO) (Volts )	T (m sec)	F = 1/T (Hz)
0.47				
4.7				
100				

8. Draw the output signal voltage each time of  $C_L$  values with true scale.

9. Calculate the ripple factor  $r$  using the following equation

$$r = \frac{1}{2\sqrt{3}} \left( \frac{1}{F R_L C_L} \right)$$

Comment on the results you obtained.