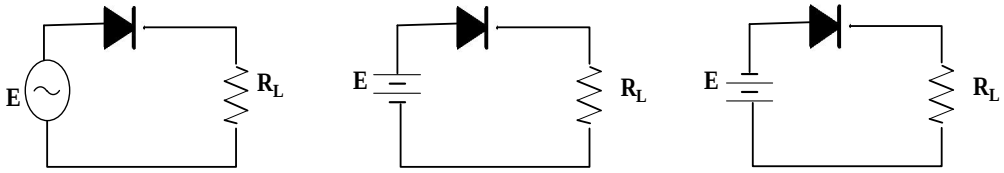
expirement 2

subject:-

Half wave rectifier (obtaining a unidirectional voltage from alternating)

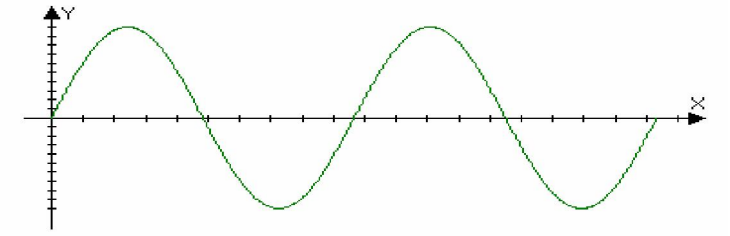
it is the first application which is used to obtain a unidirectional voltage from bidirectional (alternating) voltage source



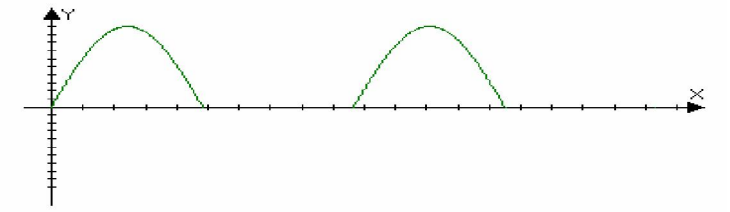
+ve Half cycle

-ve Half cycle

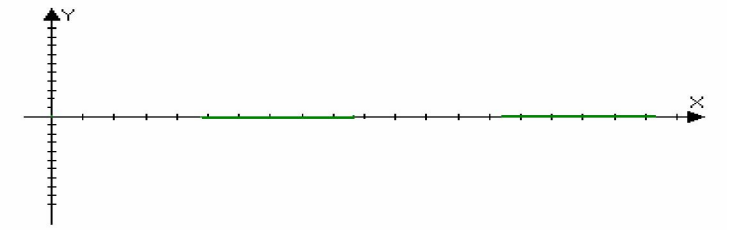
Input



+ve Half cycle



-ve Half cycle



when the supply is AC source with maximum voltage V_m the supply has two direction of voltage (+ ve & -ve) directions

* when the input is +ve half cycle , the diode is forward biased & acts as a short circuit (ideal) or a battery in the 2nd approximation and there is output voltage with maximum value = maximum of I/p signal (ideal)

Or = maximum of I/p signal - V_D (practical)

There are three types of voltage to describe sine wave

1 – Maximum value = peak value

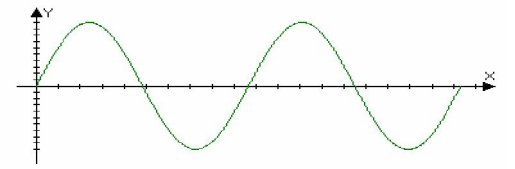
2 – RMS (root main square) = effective value =maximum value / $\sqrt{2}$

3 – average value = DC value = mean value

How to calculate the DC value

V_{DC} =area under the curve / time effective of cycle

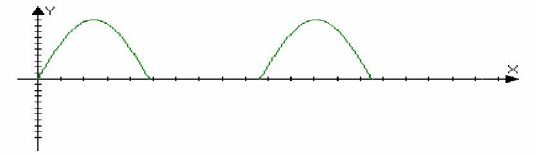
1 – for I/p signal



V_{DC} = area / 2Π = $_0\int^{2\Pi}$ (Vm sin wt dwt)/ 2Π

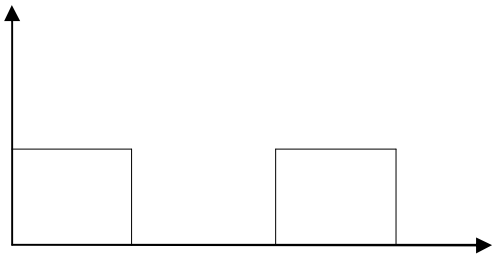
V_{DC} = zero

2- For output wave form



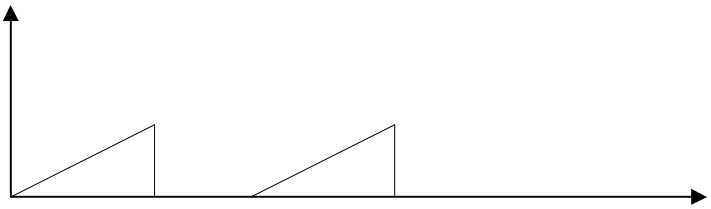
V_{DC} = $_0\int^{2\Pi}$ (V_m sin wt dwt)/ 2Π = V_m/Π

3- If the output wave form



V_{DC}=(Π * V_m + 0)/2Π = $V_m/2$

4- If the output wave form



V_{DC} = (.5 * Π * V_m + 0)/ 2Π = $V_m/4$

I_{DC} = V_{DC}/R_L = V_m / Π R_L

Note

1- The output has some ripples with factor (r)

r= (RMS of output waveform) / (DC value of output waveform)

$r = ((I_{rms} / I_{DC})\ 2 - 1)^{1/2}$

2- for the output of Half Rectifier of sin wave I/p

$I_{rms} = I_m / \sqrt{2}$

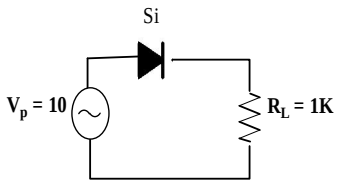
Regulation factor (s %)

* V_0 → no load voltage measured at o/p of rectifier circuit (cross R_L)

* V_L → full load voltage measured at o/p of rectifier circuit

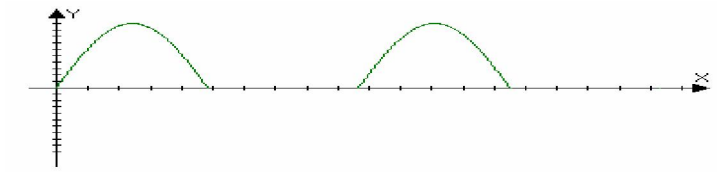
* % $S = ((V_0 - V_L)/V_0)*100$

Example

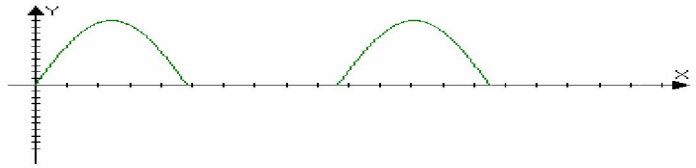


1- In +ve half cycle (diode is on (s.c)) and the o/p is as i/p

Vomax= 10



Imax = 10mA



2- In –ve half cycle (diode is off (o.c)) and

* o/p current = (Vmax /R)=(10 /1K)=10 mA

* voltage on diode when diode is reversed

VD = Vinmax = -10 V