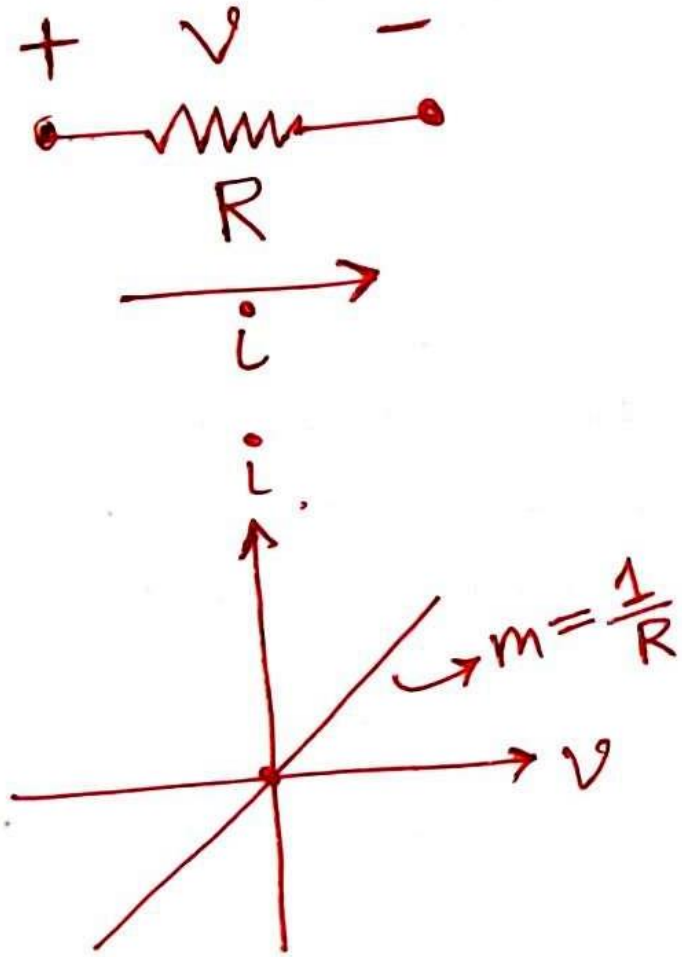
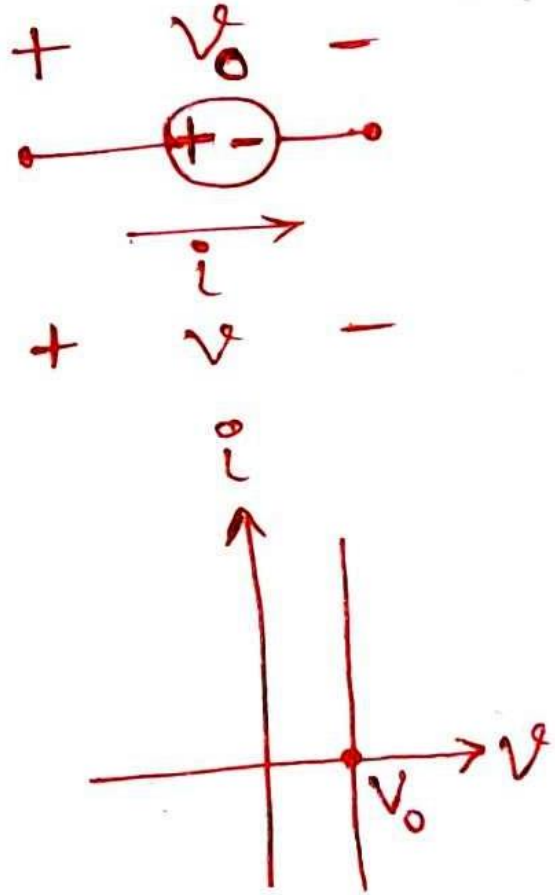
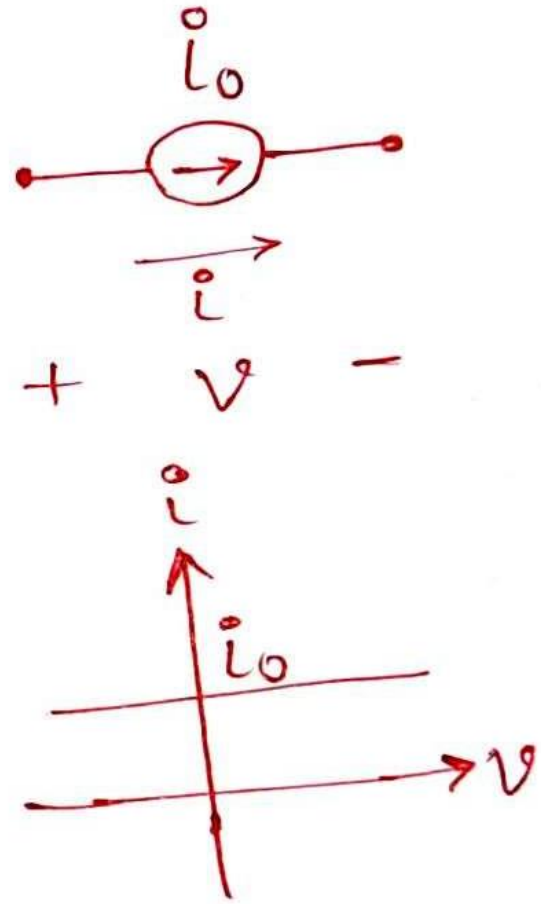
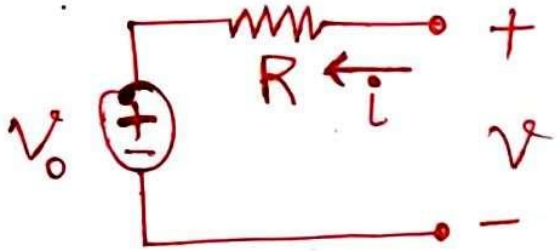
IV Characteristics







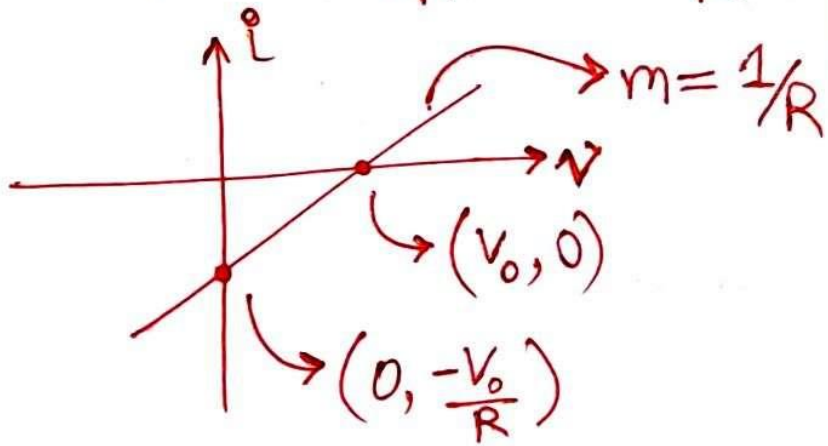


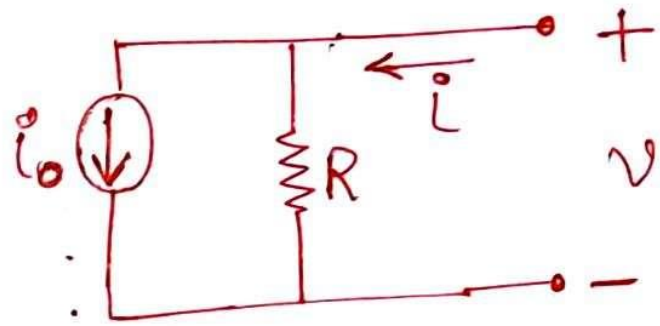
$$i = \left(\frac{1}{R}\right)v - \frac{V_o}{R}$$

This is equivalent to,

$$y = mx + c$$

where, $m = 1/R$, $c = \frac{-V_o}{R}$



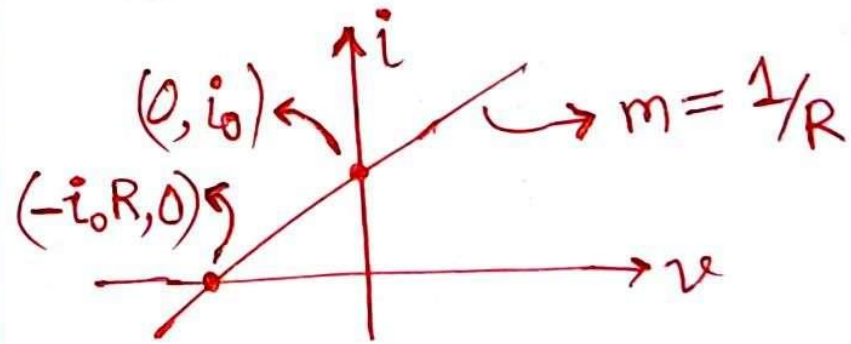


$$i = \left(\frac{1}{R}\right)V + i_o$$

This is equivalent to,

$$y = mx + c$$

where, $m = 1/R$, $c = i_o$



Diode

ideal diode

if $V_D > 0$,

ON/Forward Bias

hence, short ckt

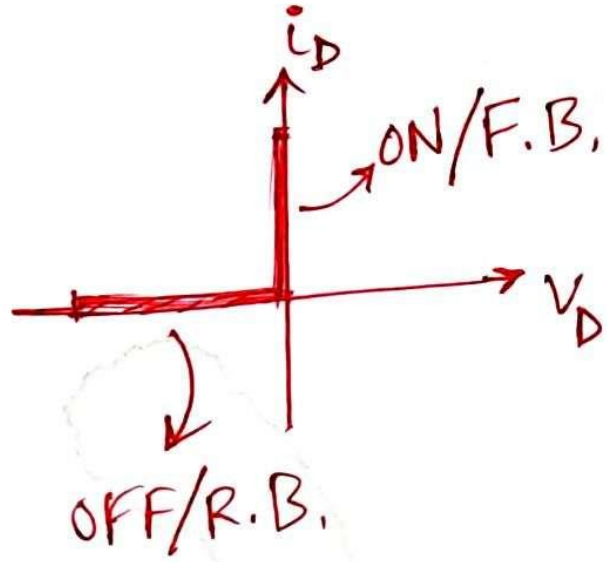
$i_D > 0$, $V_D = 0$

if $V_D \leq 0$,

OFF/Reverse Bias

hence, open ckt

$i_D = 0$.

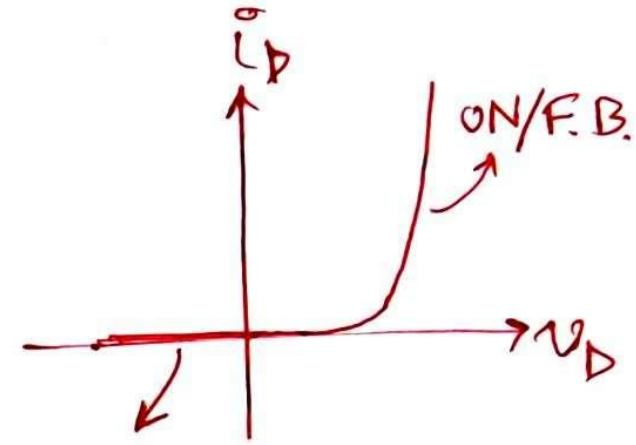


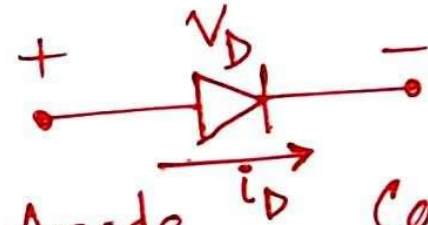
Verification conditions in method of assumed state for ideal diode,

ON $\rightarrow$ $i_D > 0$

off $\rightarrow$ $V_D \leq 0$

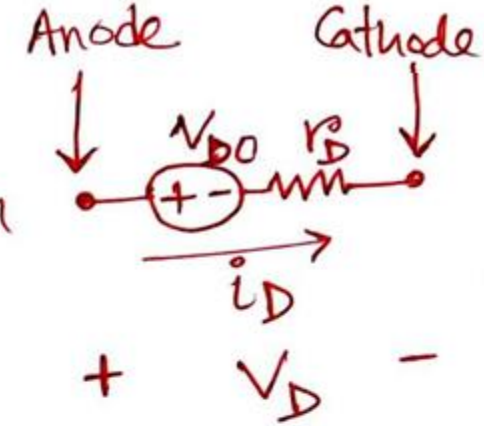
Real Diode





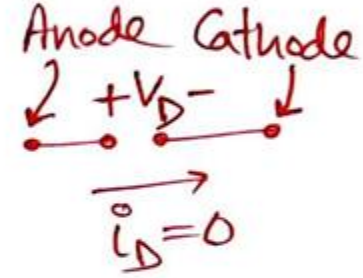
CVD+R model

ON/F.B. → if $V_D > V_{DO}$ → replace with



$$V_D = V_{DO} + i_D r_D$$

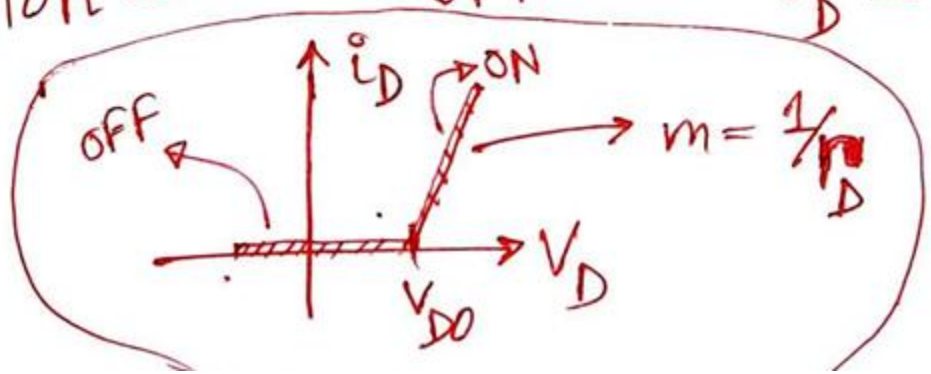
OFF/R.B. → if $v_D \leq V_{DO}$ → replace with



M.A.S conditions in verification

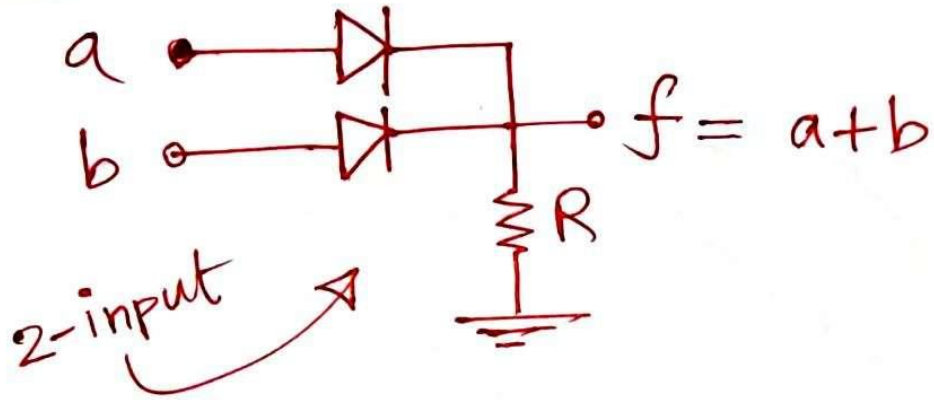
ON → $i_D > 0$

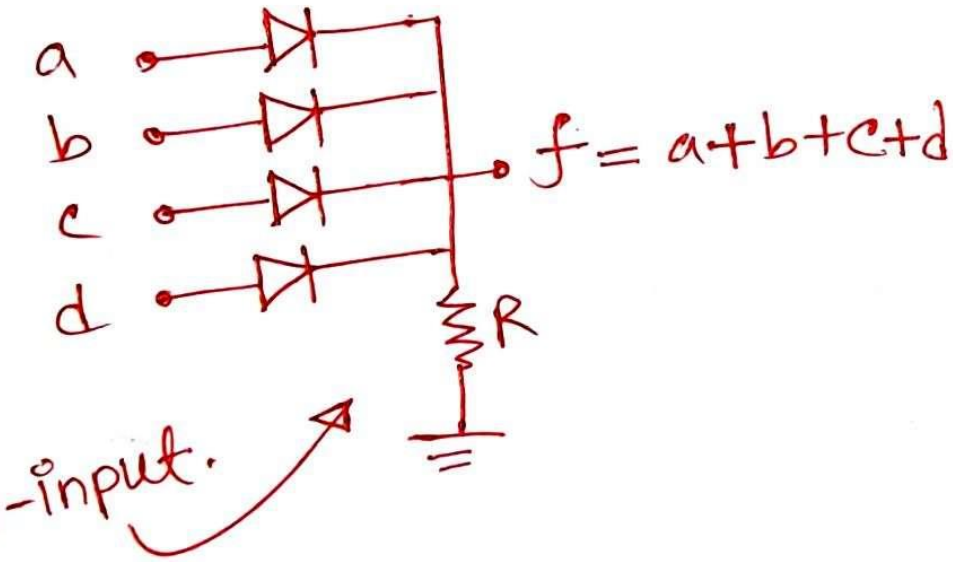
OFF → $v_D \leq V_{DO}$



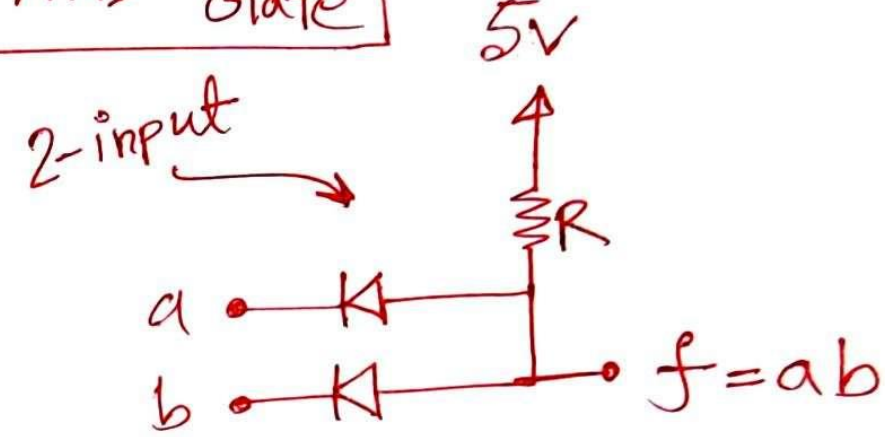
Diode Logic Gates → only AND, OR gates can be implemented

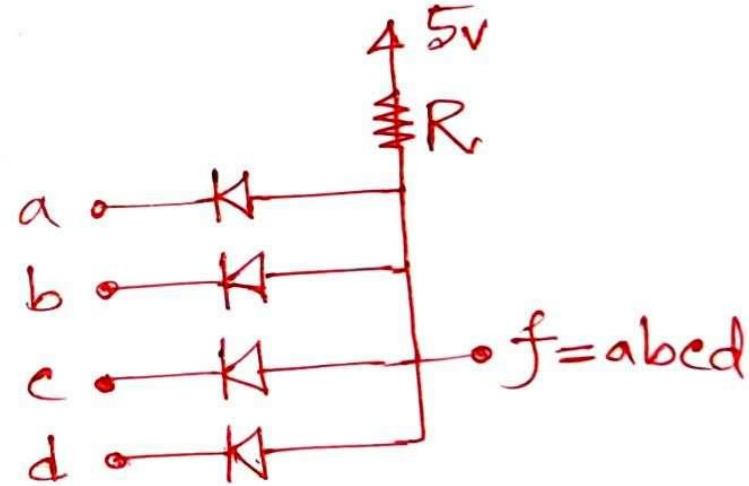
OR Gate





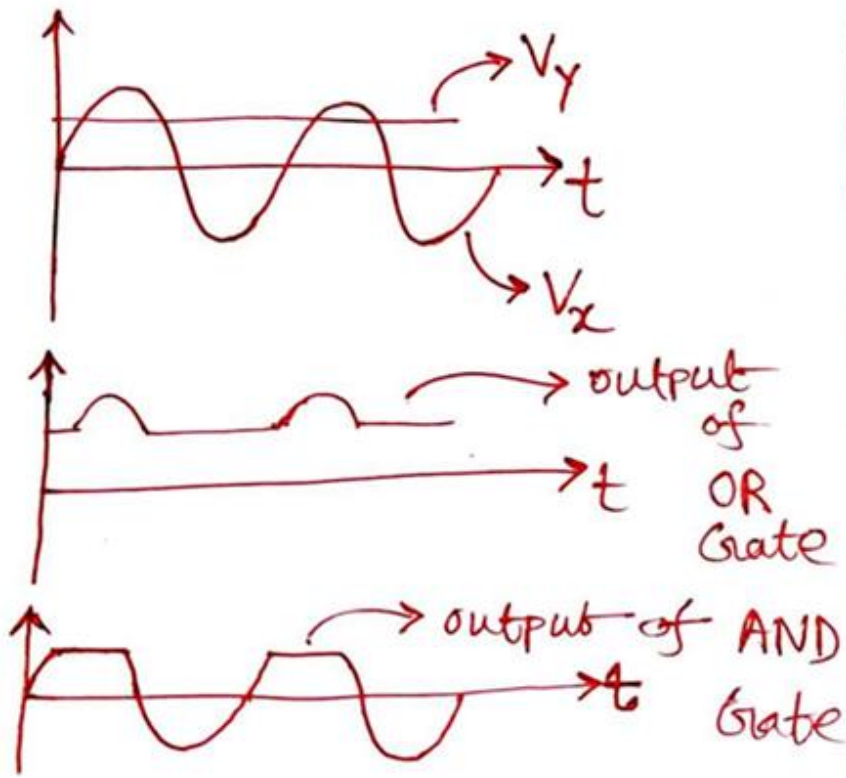
AND Gate



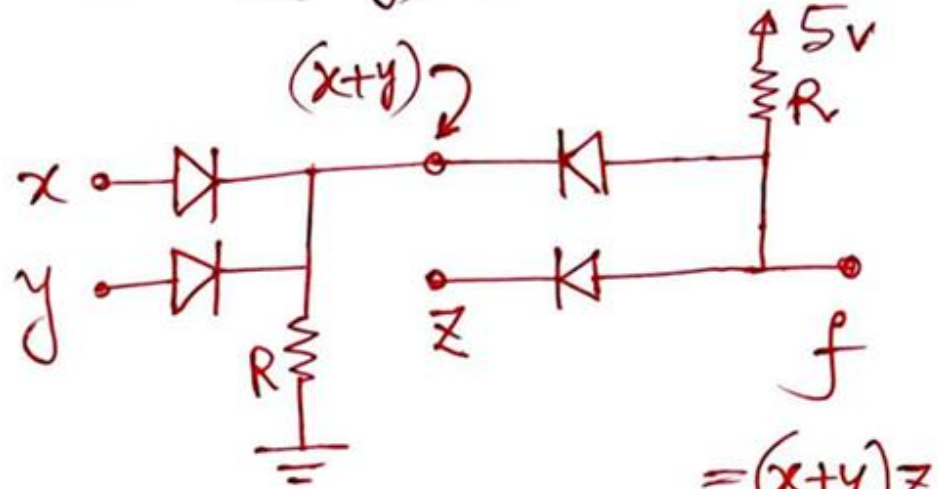


OR Gate → also does
Max operation

AND Gate → also does
Min operation

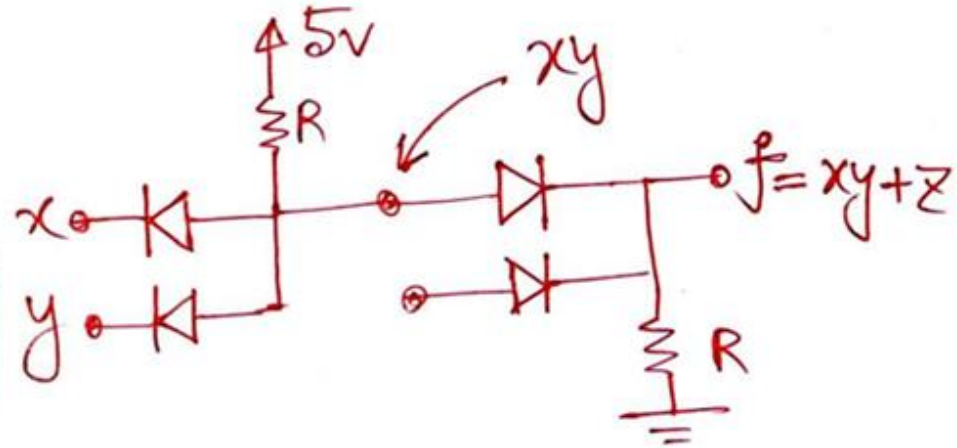


$f = (x+y)z$

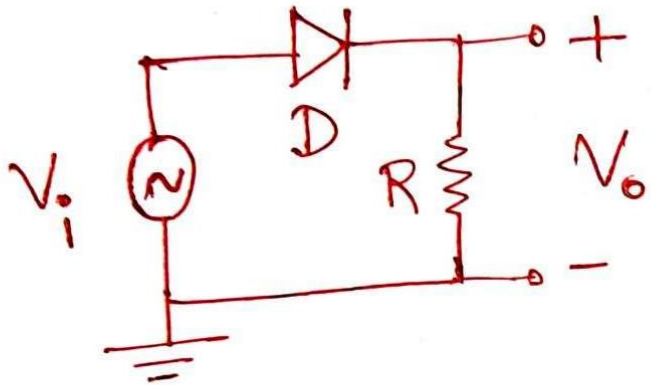


$= (x+y)z$

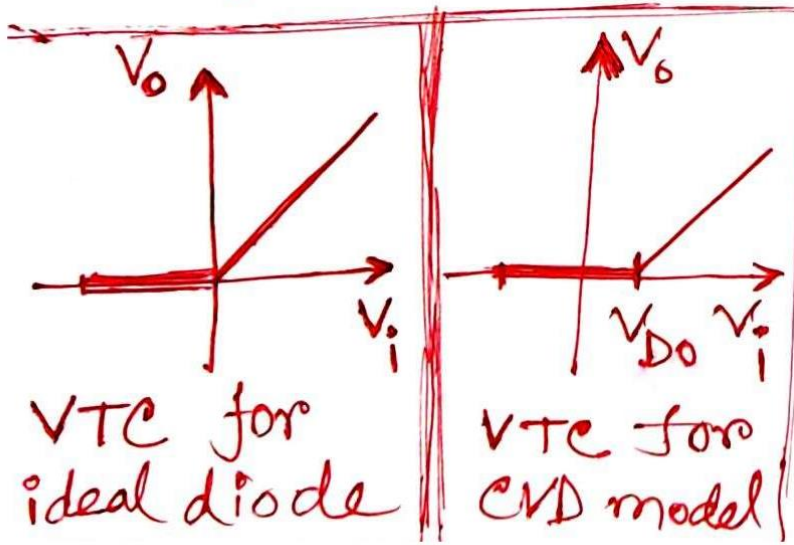
$f = xy + z$



Half Wave Rectifier

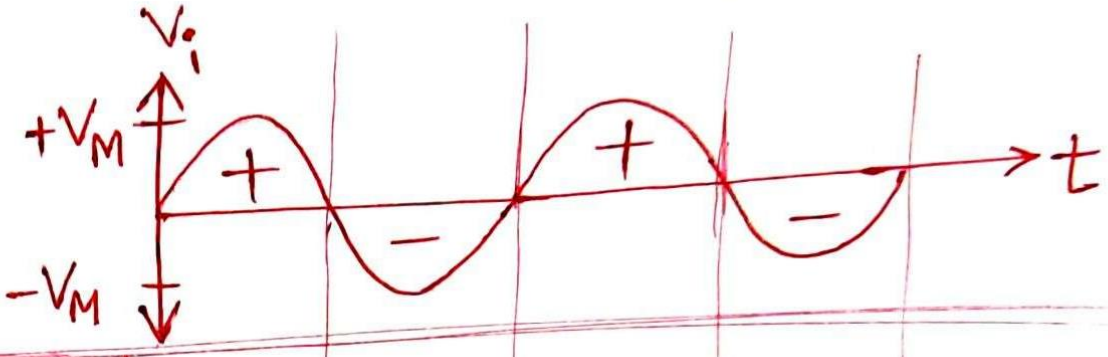


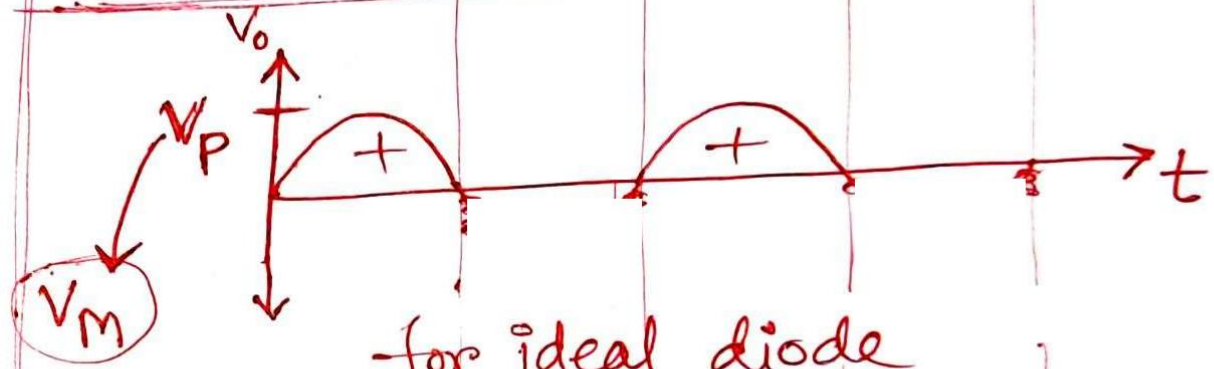
$$V_i = V_M \sin(\omega t)$$



VTC for ideal diode

VTC for CVD model

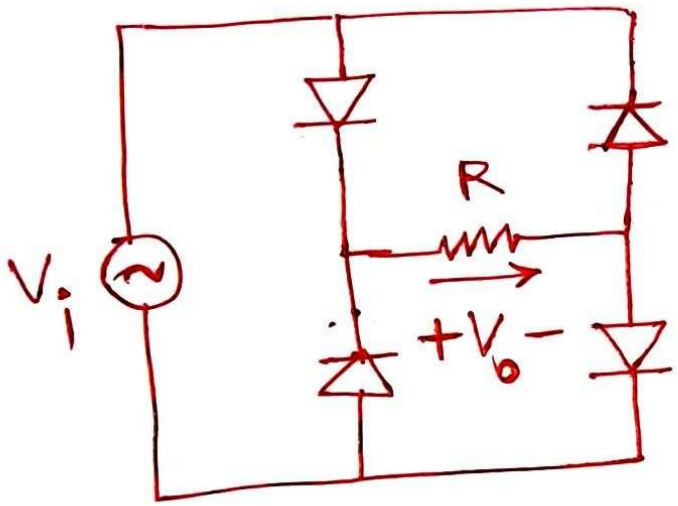




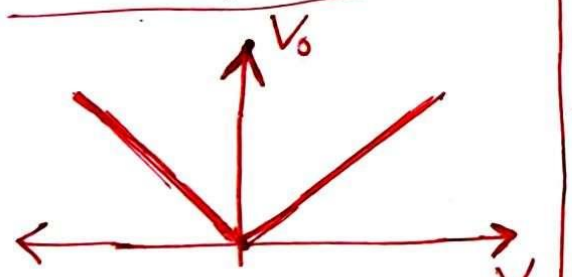
for ideal diode

for CVD model

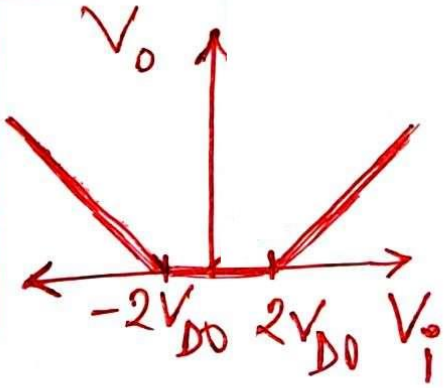
Full Wave Rectifier

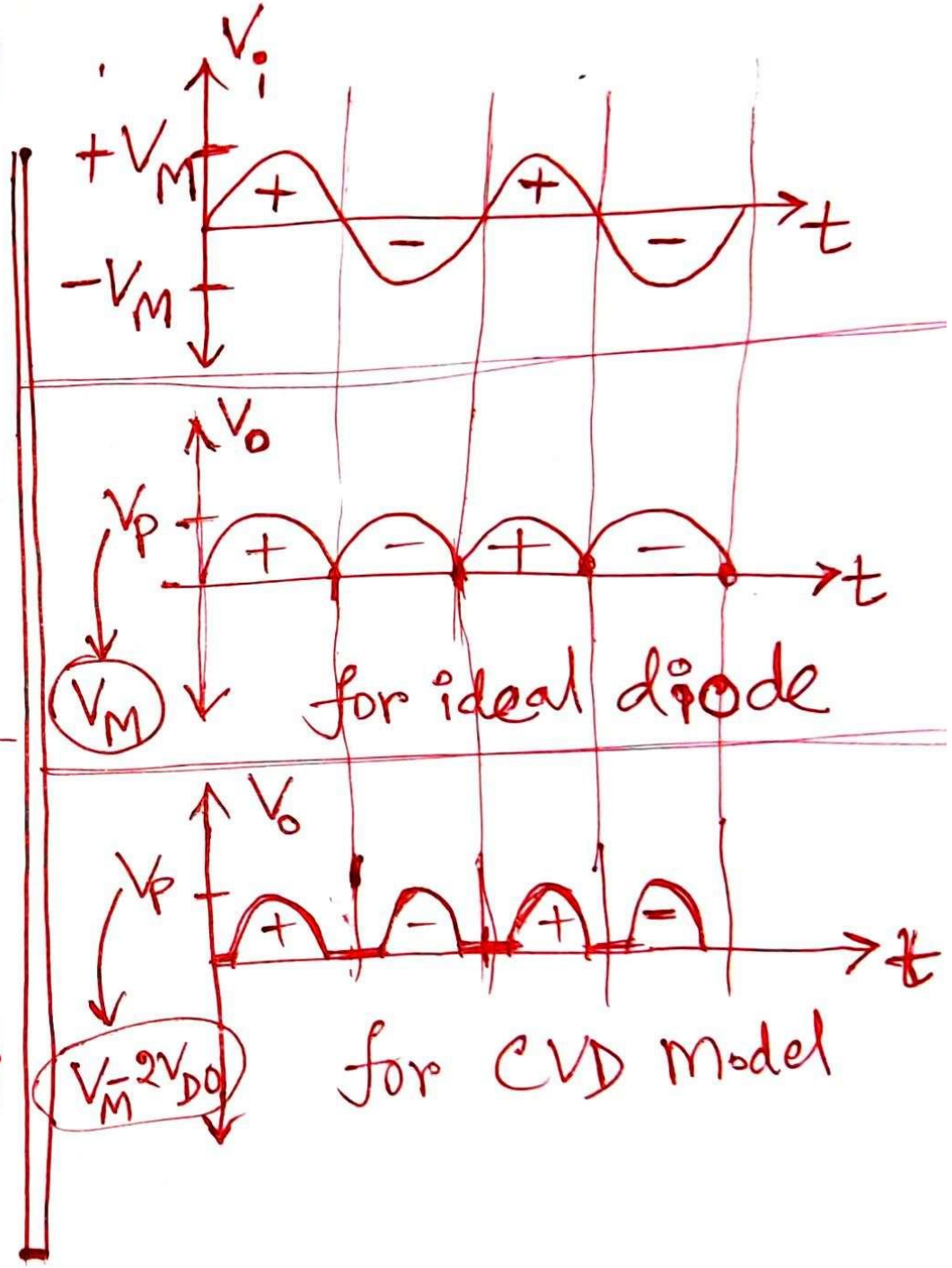


$V_i = V_m \sin(\omega t)$



VTC for ideal diode





Rectifier without Capacitor

Half Wave → ideal diode → V_{dc} or; $V_{avg} = \frac{1}{\pi} V_M$

Half Wave → real diode → V_{dc} or; $V_{avg} = \frac{1}{\pi} V_M - \frac{1}{2} V_{DO}$

Full Wave → ideal diode → $2/\pi\, V_M$

Full Wave → real diode → $2/\pi\, V_M - 2V_{DO}$

Rectifier with Capacitor

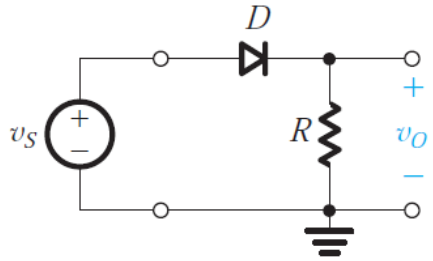
$$V_{r(p-p)} = \frac{V_p}{f_r R_c}$$

$$V_{dc} \text{ or; } V_{avg} = V_p - \frac{1}{2} V_{r(p-p)}$$

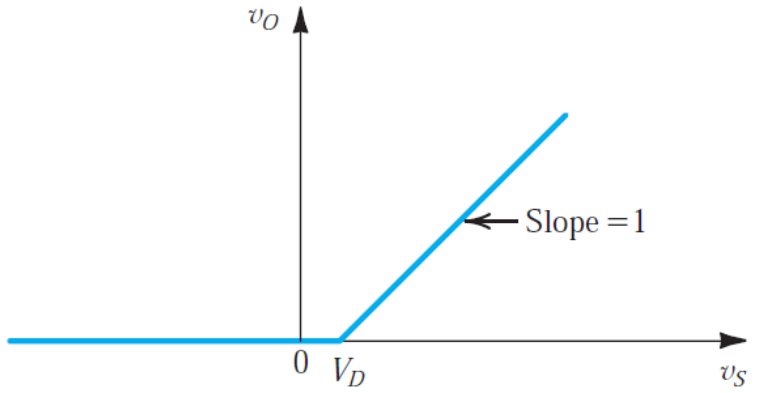
Half Wave → $f_r = f_i$

Full Wave → $f_r = 2f_i$

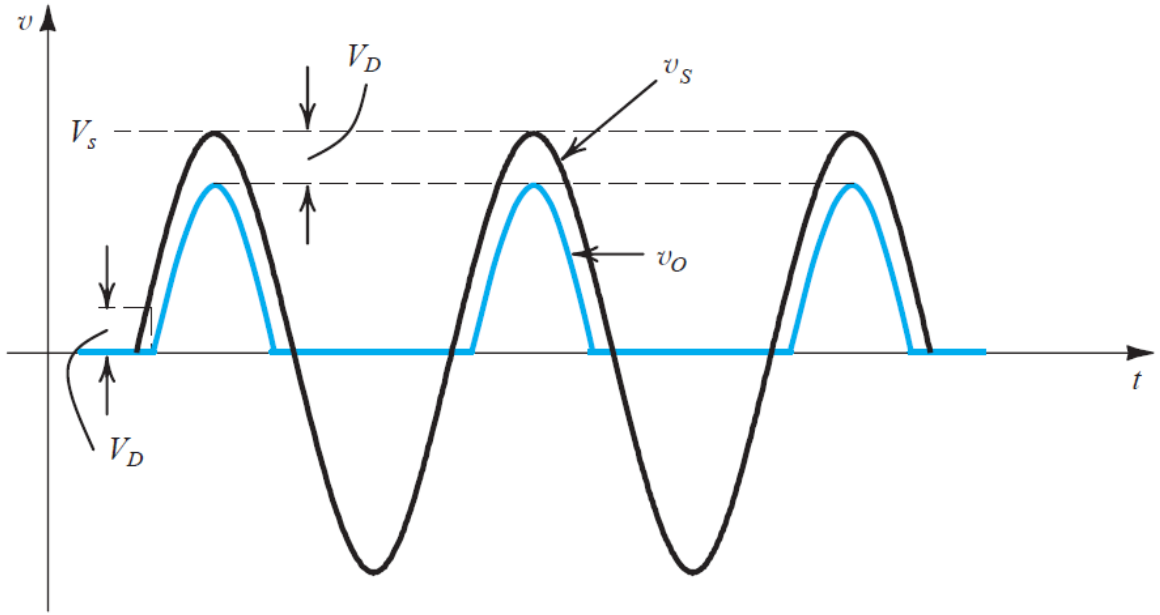
Half Wave Rectifier without capacitor



(a)



(b)



Half Wave Rectifiers with capacitor