

CIRCUITS USING DIODES.

① CLIPPER CIRCUITS

The circuit with which the waveform is shaped by removing or clipping a certain portion of the input signal voltage above or below a certain level is called a clipping circuit or clipper.

Uses: Digital computers, radars, radio & T.V. receivers.

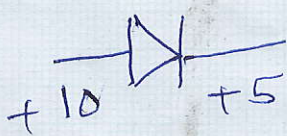
(1) SERIES CLIPPER: Diode connected in series with input or load

(2) SHUNT CLIPPER: Diode connected in parallel with input or load

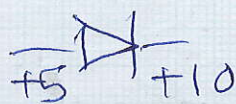
e.g. (1) series clipper (2) Shunt clipper



Note: Before analyzing the clipper circuit one basic should be clear.



Forward bias



Reverse bias



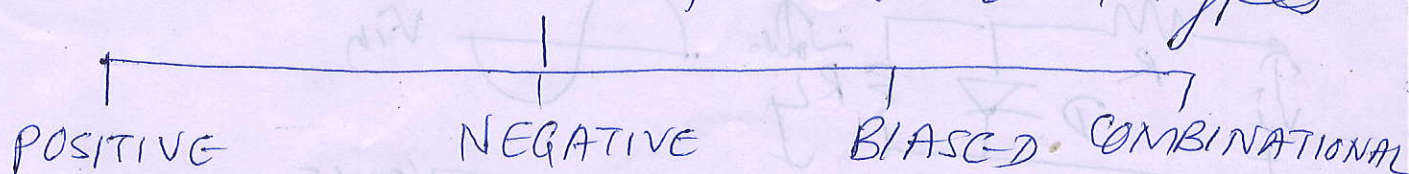
Reverse bias



Forward bias

(This is not given in any book)

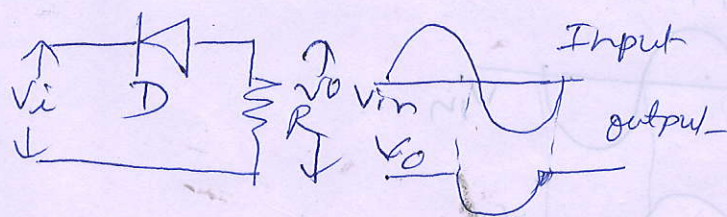
Clippers are classified into 4 types



You will see that 2 circuits will have same output. Therefore I will analyze one circuit. The other circuit will be analyzed with conditions / biasing of diodes changed. Therefore I request you to complete analysis of other circuit having same output.

For example I will do the ~~analysis~~ analysis of first two circuits

① SERIES POSITIVE CLIPPER



+ve half cycle
Diode is reverse biased

\therefore it acts as open circuit

$$\therefore V_o = 0$$

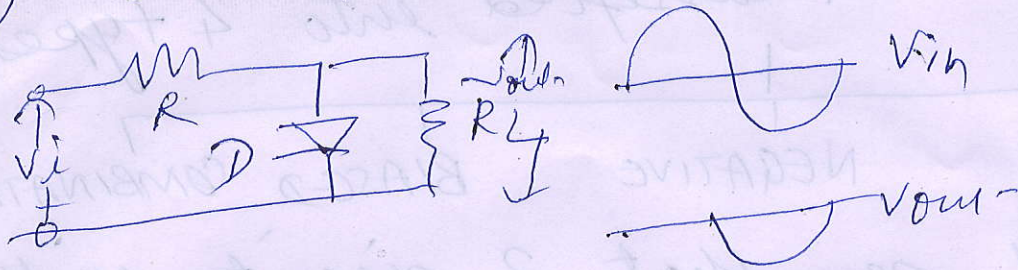
-ve half cycle

Diode is forward biased

\therefore It acts as short circuit

$$\therefore V_o = V_i$$

Now the circuit (2) (3)
 (2) SHUNT POSITIVE CLIPPER

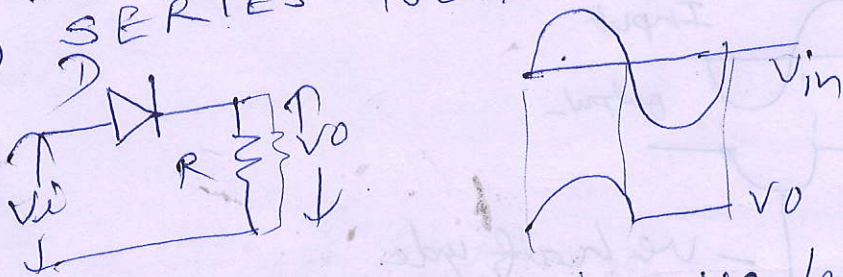


+ve half cycle
 D is forward biased
 It acts as short circuit
 $\therefore V_o = 0$

-ve half cycle
 D is reverse biased
 It is open
 $\therefore V_o = V_i$

So you can see only the biasing of diodes changes. So you are requested to complete the analysis of the circuits which I am leaving blank.

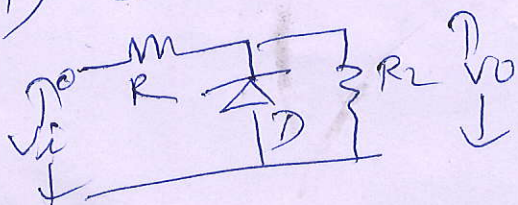
(3) SERIES NEGATIVE CLIPPER



+ve half cycle
 D is forward biased
 $\therefore V_o = V_i$

-ve half cycle
 D is reverse biased
 $V_o = 0$

(4) SHUNT NEGATIVE CLIPPER

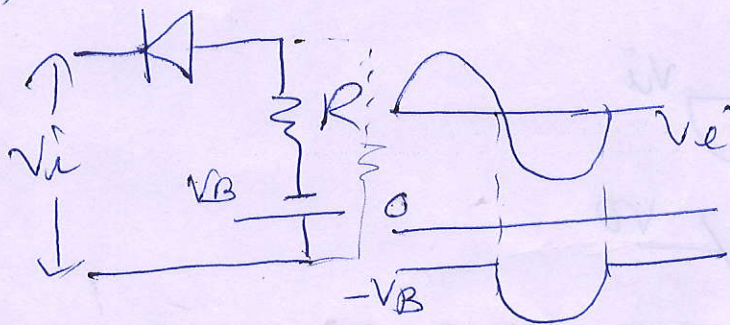


BIASED CLIPPERS

Circuits (1) to (4) clip the entire positive or negative portions of input signal i.e. there is no provision for adjustment of clipping level.

A clipping circuit which has a provision for adjustment of a clipping level is called biased clipper. An adjustment of clipping level is achieved by adding a bias voltage in series with a diode or resistor.

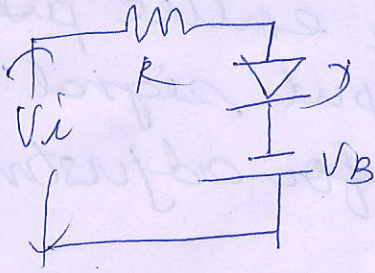
(5) BIASED SERIES POSITIVE CLIPPER.



<p>+ve half cycle</p> <p>D is reverse biased for entire cycle.</p> <p>$\therefore V_o = -V_B$ (drop across R is neglected)</p>	<p>-ve half cycle</p> <p>(a) Till $V_i \leq V_B$ D is reverse biased $V_o = -V_B$</p> <p>(b) $V_i > V_B$ D is forward biased $V_o = V_i$</p>
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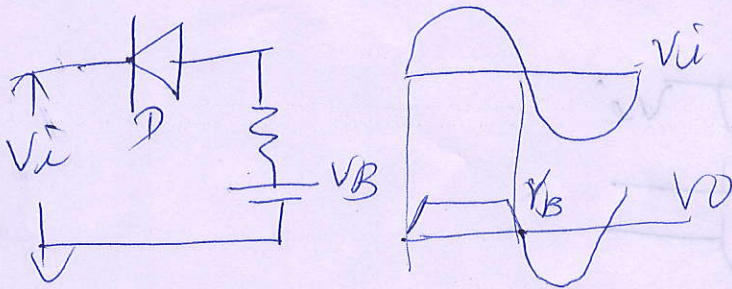
$|V_i|$ means absolute value of V_i is taken

(6) BIASED SHUNT POSITIVE CLIPPER (5)



Analysis same as ckt 5 with Biasing of D changed.

(7) BIASED SERIES POSITIVE CLIPPER



+ve half cycle

(a) Till $V_i \leq V_B$

D is forward biased

$$V_o = V_i$$

(b) $V_i > V_B$

D is reverse biased

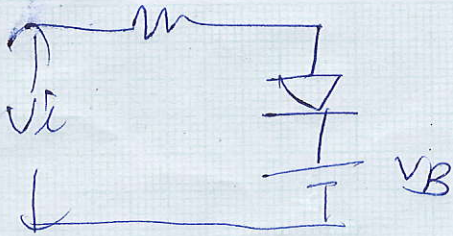
$$V_o = V_B$$

-ve half cycle

D is forward biased for entire cycle

$$V_o = V_i$$

(8) BIASED SHUNT POSITIVE CLIPPER



Analysis same as circuit no. 7 with biasing of diodes changed.