(2) 1 85

①

→ Oscilloscope:
Instrument display all electrical signal graphically and shows how these signal are varying w.r.t time.

Function generator:
Instrument used to generate different type of electrical square, sinus, triangular.

Proteus:
Instrument used to design and simulating electronic circuit.

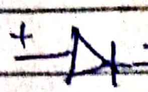
Proteus advantage:
→ takes less time than practical designing
→ error chances is less
→ low possibility of burning & damaging element

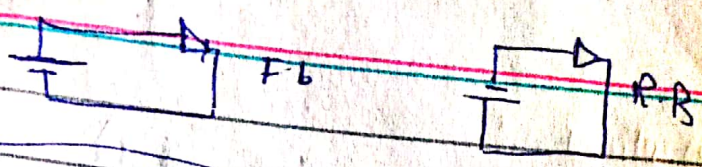
→ feature of Proteus:
① Schematic design
② PCB layout

② Diode ~~ID = 1N400 etc Si~~
Ge

Diode: semiconductor device, ~~Component~~ conduct current in one direction & Resist current in other direction.
→ in forward bias current flow.
→ in reverse bias current stops

main function:
main function is that to allow current in one direction, to resist current in other direction.





(3)

→ Series Diode combination

→ Voltage different across each Diode

→ Current same

* Characteristic in series:

→ Resultant diode forward voltage increase b/c in series V added

→ Reverse blocking capability increase mean no conduction.

→ Parallel Combination of Diode

→ Voltage same across each diode

→ current different across each diode

* characteristic in parallel

→ current carrying capacity increase b/c in ∥ I adding

→ No Conduction in Resultant diode in both side

(4) Rectifier convert Ac to Dc

→ half wave Rectifier

type of Rectifier that convert only one-half of Ac cycle to pulsating DC

→ b/c first +ve Bias then R.bias due to change in polarity of A.c

→ full wave Rectifier

convert Complete cycle of Ac to pulsating DC.

→ due to Diode bridge.

→ Diode Application:

→ Switch in logic gate
→ As Rectifier
→ As clipper
→ As Clamper
→ Reverse current protection
→ Voltage multiplier

(S) → Remove exceeded voltage.

Clipper circuit: ≃ V Predefined

→ limiter ckts

→ wave shaping circuit remove or clipp off +ive or -ive half cycle of the wave without changing the remaining part of signal

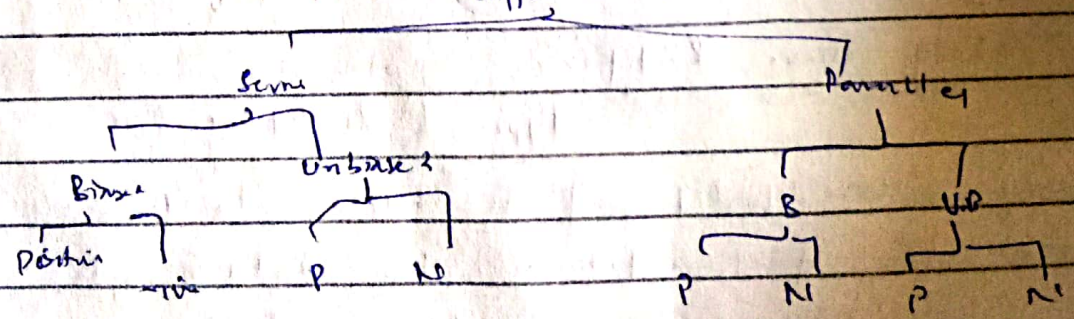
(or) remove small portion of +ive or signal

→ Also known as protecting device.

≃ V Required voltage input ...

... clipp ...

Classification



→ Series:

=+ive

→ unbiased Series clipper circuit no extra DC and diod is connected in reverse biased

→ -ve negative Se. C.L.

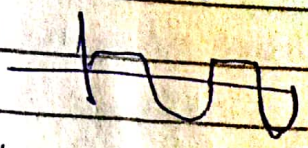
diode is connected in forward biased

→ biased clipper ckt

extra DC voltage source and we can remove any portion of ip wave

→ +ve b.c.c.

diode is reverse biased

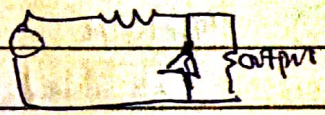


→ -ve biased,

+diode forward biased

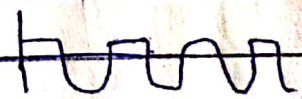
⇒ Parallel:

→ Diode connected in parallel with voltage source



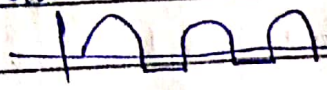
① +ve unbiased P.C.C

→ diode is connected in forward biased



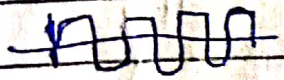
② -ve unbiased P.C.C

→ diode is in reverse biased



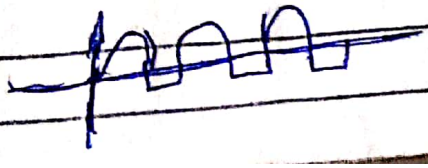
① positive biased P.C.C

→ diod forward biased + DC voltage source



② -ve biased P.C.C

→ diode reverse biased + DC voltage source



Clipper circuit consist of linear & non-linear element : not energy storage element.

(6)

Clamper : → It does not clip the signal.

→ Signal level - Shifter.

~~level of the signal to desired level~~

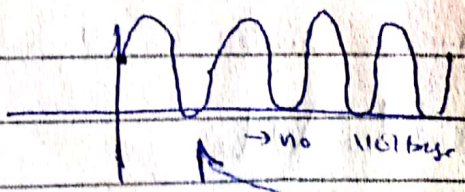
→ device which shift the DC level of the output signal to either +ve or -ve direction ↑ or ↓

Three type of Clamper circuit.

(i) positive clamper : [Diode Reverse biased] So $V_{out} = V_{in}$

(a) +ve half cycle → Diode reverse biased → capacitor Discharge So $V_{out} = 2V_{in}$

So



Since V_{in} +ve

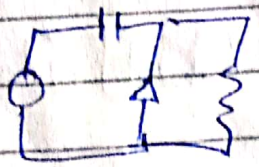
→ no voltage drop forward biased

(b) -ve half cycle

→ Diode forward biased So $V_{out} = 0$

→ capacitor charging So $V_c = 0$

So, $V_{out} = 0$



(2) -ive clamper. (Diode forward biased)

-it shift output signal to downward

(a) During +ve half cycle.

→ Diode forward biased So $V_{out} = 0$

→ Capacitor charge to $V_c = 0$

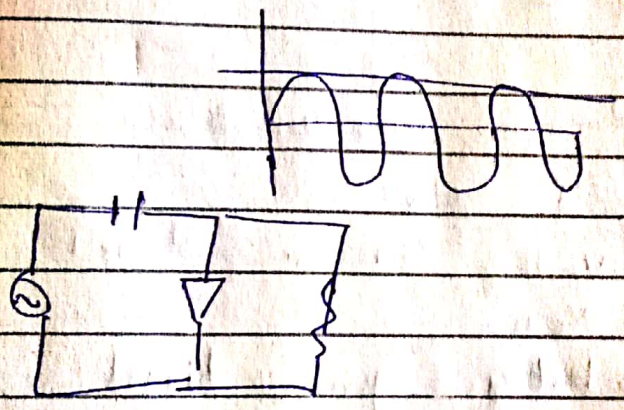
So. $V_{out} = 0$

(b) During -ve half cycle

→ Diode Diode reverse biased so $V_{out} = V_{in}$

→ capacitor discharging So $V_{out} = V_c$

So $V_{out} = 2V_{in}$ (or) $V_{in} + V_c$



(3) Biased clamper:

→ Sometime additional shift is need

So, we add another DC source.

Four type

(a) Positive clamper with Positive biased

-During +ve half cycle

→ If $V_{in} < V_{battery}$ Diode forward biased capacitor charge

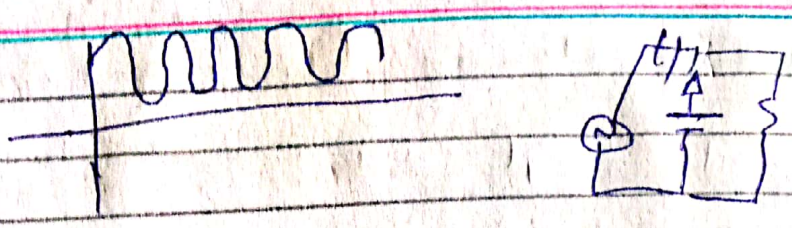
If $V_{in} > V_{battery}$ Diode Reverse biased capacitor discharge

$V_{out} = V_{in} + V_c$ → here V_c more charged to extra shift.

(b) → During -ive half cycle.

→ Diode forward by both voltage source So

$V_{out} = 0$ V(-) capacitor charging $V_c = 0$

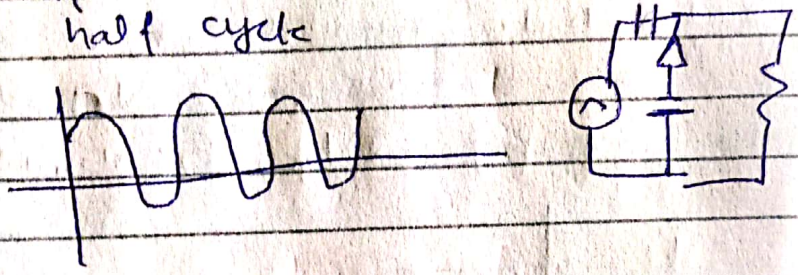


② Positive clamper with -ive biased.

→ +ive half cycle

if $V_{in} < V_{battery}$ Diode reverse biased so small output in -ive cycle.

→ +ive half cycle



③ -ive clamper with +ive Biased

-positive half cycle

if $V_{in} < V_{battery}$ reverse biased.

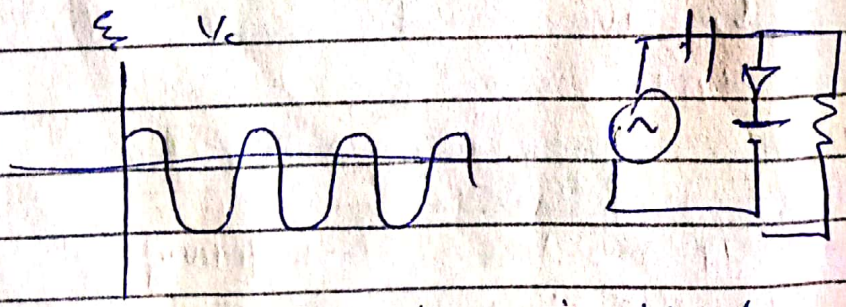
$V_{out} = V_{battery}$

if $V_{in} > V_{battery}$ forward biased

$V_{out} = 0$ Capacitor charge

-ive half cycle,

Dod is reverse biased by both V_{in} & V_c



④ -ive clamper with -ive biased.

→ During +ive half cycle.

Diode forward biased by both voltage

So $V_{out} = 0$

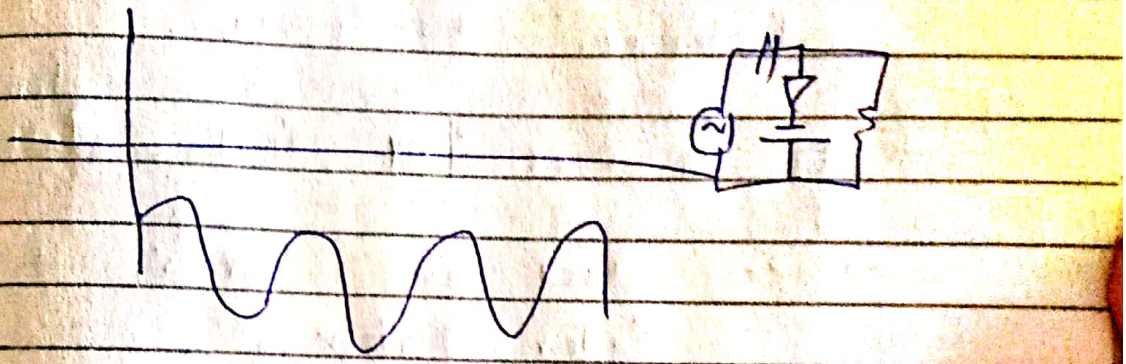
Capacitor charge more due to biasing which result in extra energy.

-ive half cycle

→ if $V_{in} < V_{battery}$ ⇒ forward biased capacitor charge $V_{out} = 0$

if $V_{in} > V_{battery}$ ⇒ reverse biased

$V_{out} = V_{in} + V_c$



Diff b/w Clipper & Clamper.

Clipper	Clamper
① limit voltage (or restrict)	① Shift voltage up or down.
② clipper does not required any energy storing element	② while clamper required capacitor to complete the circuit.
③ Shape of output signal is differ than shape of input signal	③ Shape of output signal exactly same as shape of input signal
④ Also called current, voltage or Amplitude delimiter	④ voltage multiplier.
⑤ Dc level ~~Same~~ remain same	⑤ Dc level shifted

Uses of Clipper & Clamper

Clipper
- → Clippers are used in communication circuits such as Transmitters or Receivers.
- → Clipper also used in wave shaping circuit to generate triangular & rectangular wave.

Clamper
- → it is used for voltage doubling
- → it used in Sonar, & Radar system.

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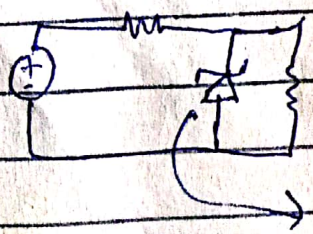
(7) Zinner Diode
- → Special Diode work at voltage equal to breakdown or greater than b.d.v.
- → act both in reverse & forward bias
- → it act as normal diode in forward bias
- → it act as voltage regulator in reverse bias
- → principle is zener breakdown,
  - ↳ mean we doped diode heavily to narrow depletion region.



→ it will be in reverse biased

→ each Zener diod use properly when its threshold load Resistance is greater or equal to Threshold Resistance

Threshold Resistance:

$$V_{out} = \frac{V_{in} \times R_L}{R + R_L}$$

$V_{out} = (V_D)$

maximum efficiency:

D/f b/w Zener diod & normal

(1) normal diode conduct uni-directional current
Zener Diode conduct bi-directional current.

(2) In Zener diode sharply doping
In normal " moderately doping.

(3) breakdown is sharp in Zener diode
" " high " normal diode

(4) Zener diode use in reverse biased mode while normal diode don't use in reverse biased mode.

(5) normal diode used as Rectifier, clamper clipper while Zener diode used as voltage regulator.

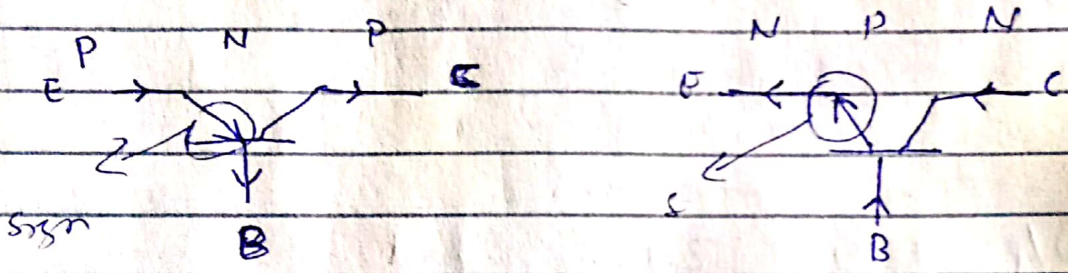
Lab 8

Transistor

→ Semiconductor electronic device use to amplify or switch electronic signal

→ made from 2 PN-Junction Diode
  → Emitter-base, collector-base

→ 3-terminals.



⇒ three terminal

(1) Emitter → heavily doped. b/c through which electron enter.
→ always F. biased w.r.t base

(3) Base : lightly doped b/c through which electron pass from Emitter to Collector. B-E → low resistance
B-C → high resistance.

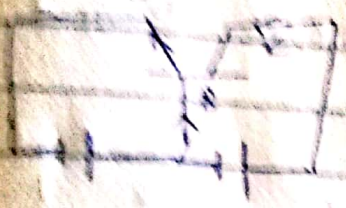
(3) Collector
→ moderately doped
which collect electron.

Types two types

(3) Bi-polar junction T
  → functionality depend on both majority & minority charge carrier
  → NPN, PNP

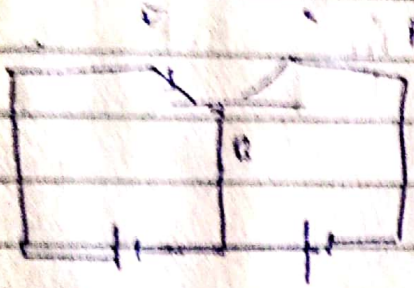
(3) uni-polar junction transistor
  → depend on majority charge carrier.

① NPN



$I_C = \beta I_B + I_{CEO}$

② PNP:



$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = \frac{V_{CC} - V_{CE}}{R_C}$$

Lab (9)

(1) Cut off mode:

→ In cut off mode both EB & CB Junction are in reverse biased.

(2) Active mode

In A.M EB Junction is F. biased & C.B Junction is Reverse biased mode.

→ in active mode it is act as Amplifier

(3) Saturation mode:

In Saturation mode both EB & CB Junction are in F. biased.

Note: In case of cut off & Situation mode Transistor act as switch

END

→ In case of Situation Transistor act is open switch

→ In case of Cut off it act as close switch