PS	N.S x=0	Z x=1
A	A-0	B-0
B	C-0	D-0
C	A-0	D-0
D	E-0	F-1
E	A-0	F-1
F	G-0	F-1
G	A-0	F-1

same

Equal

here E = G.

P.S	N.S x=0	Z x=1
A	A-0	B-0
B	C-0	D-0
C	A-0	D-0
D	E-0	F-1
E	A-0	F-1
F	E-0	F-1

same

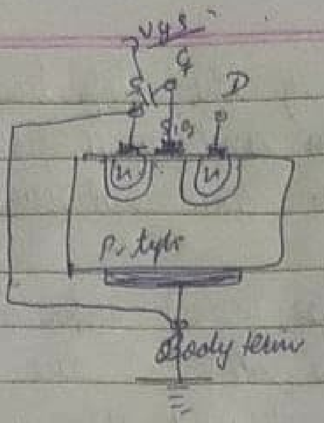
Equal

here D = F

P.S	N.S x=0	Z x=1
A	A-0	B-0
B	C-0	D-0
C	A-0	D-0
D	E-0	F-1
E	A-0	F-1

RAM	ROM
Random Access memory	Read Only memory
→ RAM is a volatile memory which could store the data as long as the power is supplied	→ ROM is a non volatile memory which could retain the data even when power is turned off
→ Data stored in RAM can be retrieved and altered	→ Data stored in ROM can only be read
→ It is a high speed memory	→ It is much slower than the RAM
→ The CPU can access the data stored on it	→ The CPU can not access the data stored on it unless the data is stored in RAM.
→ large size with higher capacity	→ Small size with less capacity
→ The data stored is easily accessible	→ The data stored is not as easily accessible as in RAM
→ costlier	Cheaper than RAM
→ Data in RAM can be modified	Data in ROM can not be modified
→ RAM sizes from 64 MB to 4 GB	→ ROM is comparatively smaller than RAM
→ Type of RAM are Static RAM and dynamic RAM	→ Type of ROM are PROM EPROM. EEPROM

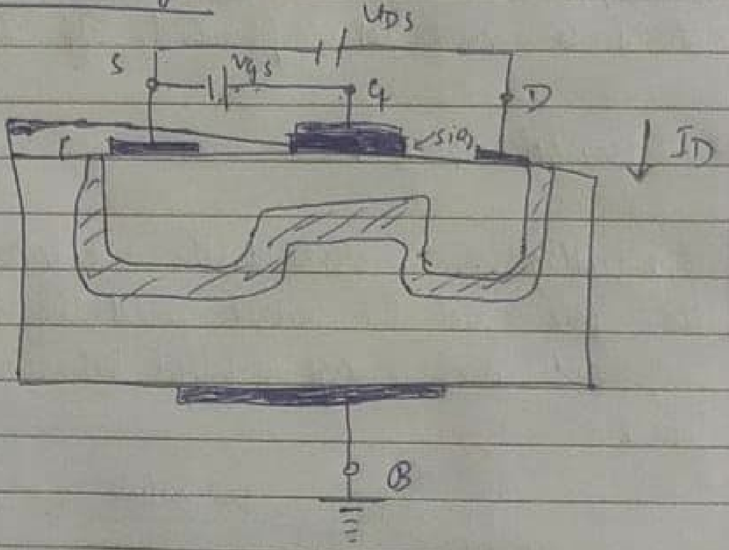
MOSFET



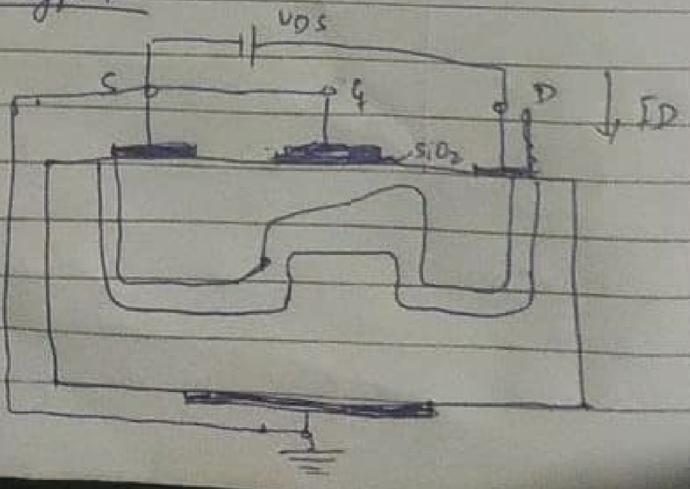
$\boxed{SiO_2 \rightarrow \text{insulator}}$

$V_{GS} = 0$ Depleted type

Enhancement Type



Depletion type :-

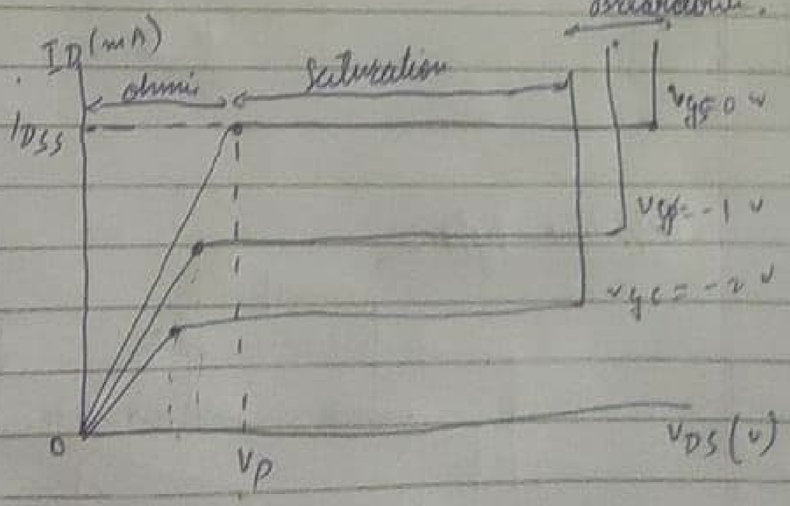


large portion of the depletion region formed between the gate drain and small portion of the depletion region between gate and source.

If small voltage (V_{DS}) applied between the drain-source with zero gate (V_G) the current (I_D) will flow through this channel now if we apply a small amount of negative voltage ($-V_{GS}$) (i.e reverse biased condition) then the depletion region width increases, which results in decreasing the portion of the channel length and reduces the conduction of the channel. The applied voltage at which the channel of FET closes is called as "pinched off voltage (V_P).

V-I characteristic

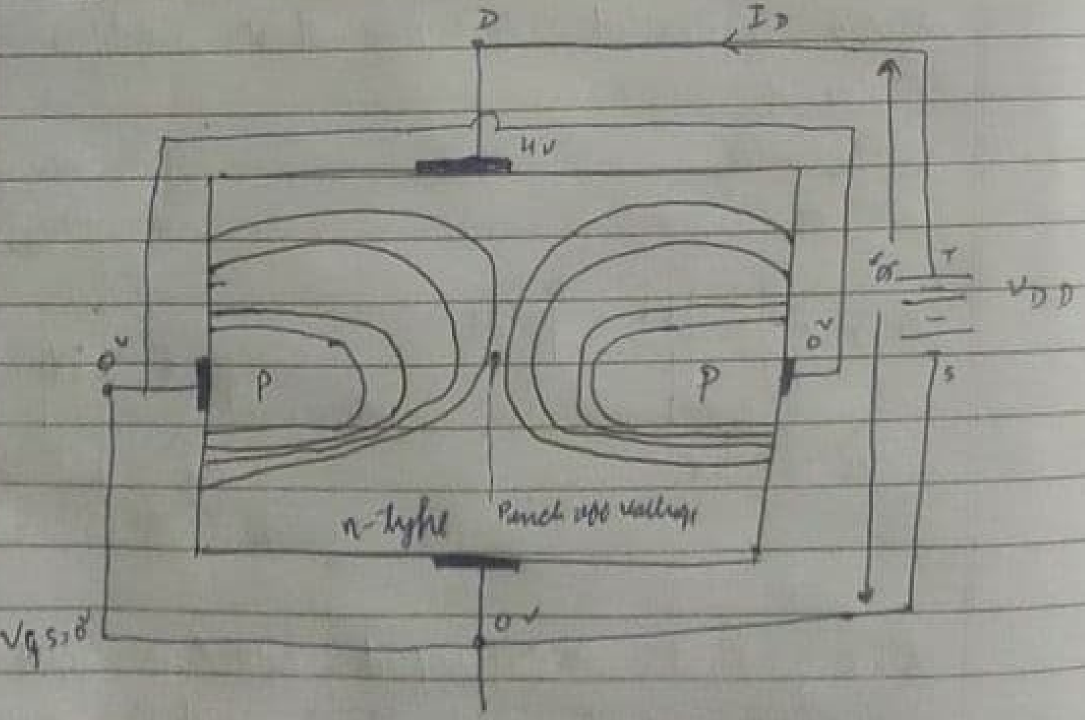
The voltage V_{GS} represent the voltage applied between the gate and the source and the voltage V_{DS} represents the voltage applied between the drain and source.



N-channel JFET are widely used than P-channel JFET's. The small voltage at the gate (G) terminal control the current flow in the channel (between gate drain and source) of the JFET

N-channel JFET biasing:-

This is a transistor with N-type of channel and with P-type material (highly doped) of the region. If the gate is diffused into the N-type channel, then a reverse bias PN junction is formed which result a depletion region around the gate terminal when no external supply is applied to the transistor

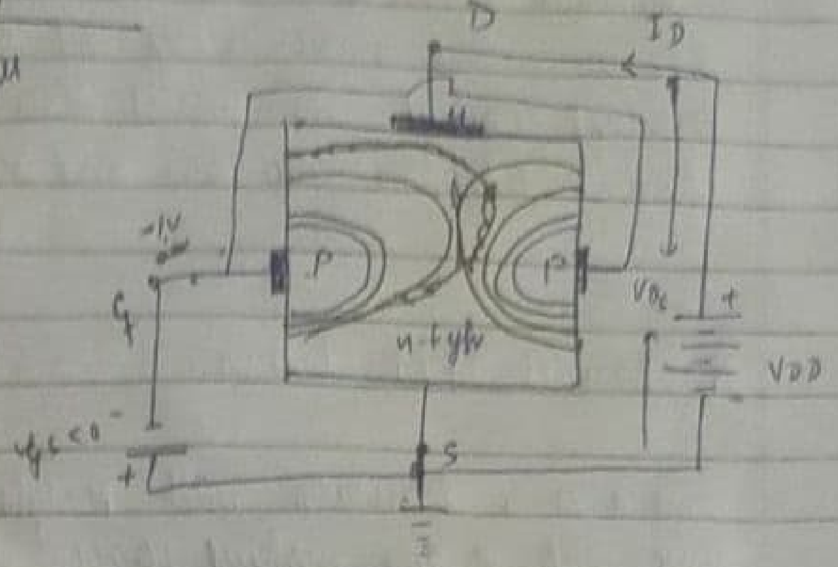


~~The depletion region produces a fo~~

Now the channel of JFET conducts with zero bias voltage applied as input. Because of the

So $v_{gs} < 0$

n-channel

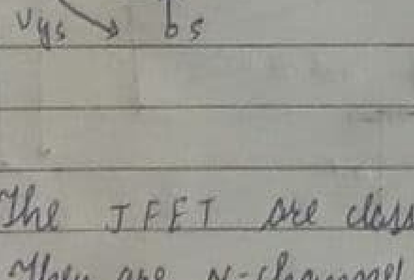


JFET:-

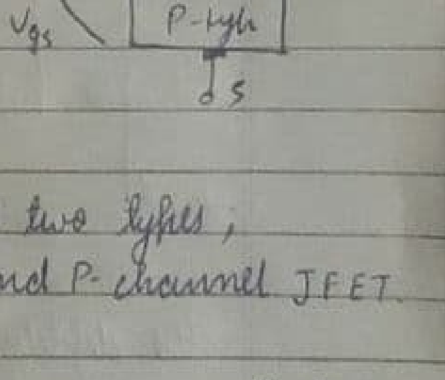
The Junction field effect transistor (JFET) is one of the types of FET transistor JFET is a three terminal device, it is used as electronically controlled switches, Voltage controlled resistor and as amplifier.

Types of JFET

n-channel

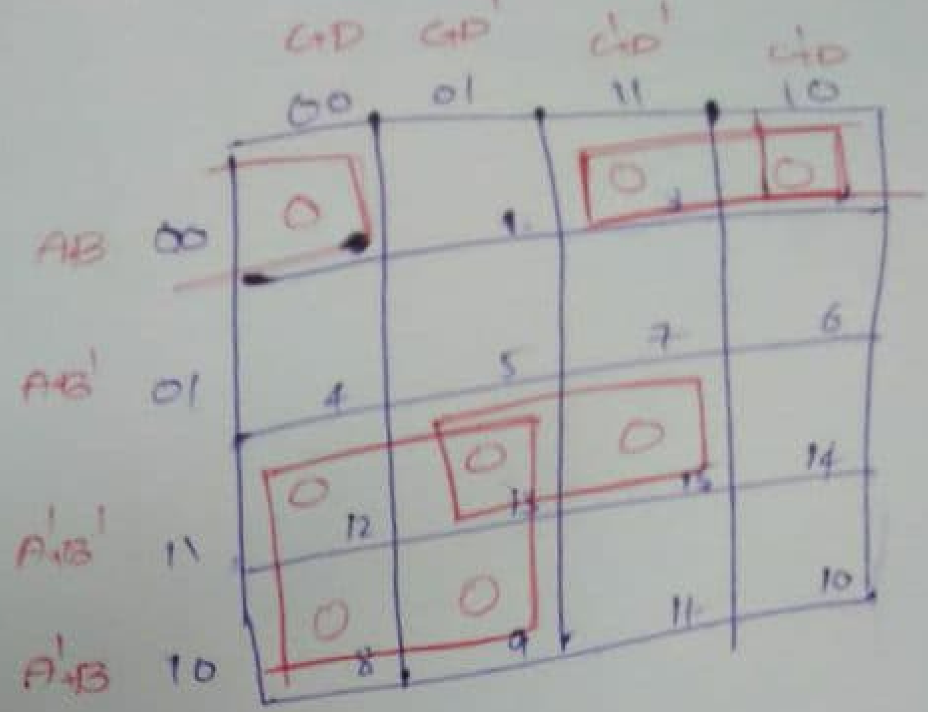


P-channel



The JFET are classified into two types;
They are N-channel JFET and P-channel JFET.

The N-channel JFET has more current conduction than P-channel JFET because the mobility of electron is greater than the mobility of holes. So the



1 → $A'+C$

2 → $A'+B'+D'$

3 → $A+B+C'$

4 → $A+B+D$

$$F = (A'+C) + (A'+B'+D') + (A+B+C') + (A+B+D)$$

b)

0010 1110 1010 1011 1000

a) $y = A'B'CD' + ABCD' + AB'CD' + AB'CD + AB'C'D' +$

1100 0011 0000

$ABC'D' + A'B'CD + A'B'C'D'$

	$C'D'$ 00	$C'D$ 01	CD 11	CD' 10
$A'B'$ 00	1 (0)	(1)	1 (3)	1 (2)
$A'B$ 01	(4)	(5)	(7)	(6)
AB 11	1 (12)	(13)	(15)	1 (14)
AB' 10	1 (8)	(9)	1 (11)	1 (10)

$= (2, 14, 10, 11, 8, 12, 3, 0)$

$= (0, 2, 3, 8, 10, 11, 12, 14)$

$1 \rightarrow AD'$ $\quad y \rightarrow AD' + B'C + B'D'$

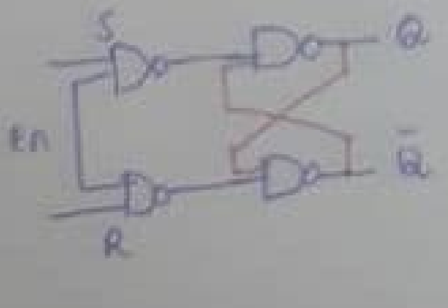
$2 \rightarrow B'C$

$3 \rightarrow B'D'$

b) $f(A, B, C, D) = \pi M(0, 2, 3, 8, 9, 12, 13, 15)$

and retains previous state when En=0

En	S	R	Q_n	Q_{n+1}	State
1	0	0	0	0	No change
1	0	0	1	1	
1	0	1	0	0	Reset
1	0	1	1	0	
1	1	0	0	1	Set
1	1	0	1	1	
1	1	1	0	x	Indeterminate
1	1	1	1	x	
0	x	x	0	0	No change
0	x	x	1	1	



Q) What is counter ? Give the diff b/w synchronous & asynchronous counter

A) A counter is a register capable of counting the no of clock pulses arriving at clock input.

Asynchronous	Synchronous
* In this type of counter flip flops are connected in such a way that the output of 1st flip-flop drives the clock for the next flip flop	* In this type of counter, there is no connection b/w Output of 1st ff & Input of next flip flop
* All the ff's are not clocked simultaneously	* All the ff's are clocked simultaneously.

Logic circuit is very **simple** even for more no of states.

Drawback-
low speed
as the clock is propagated through no of flip flops before it reaches last flip flop.

Logic circuit is very **complex** as no of states increases

High Speed
As clock is simultaneously given to all flip flops there is no problem of propagation delay. Hence they are high speed counters & are preferred when no of flip flops increases

state and output Q will be 1

ii) When $J=1, K=0, Q=1, S=0, R=0$, since $SR=00$, there is no change in the output Q i.e

The inputs $J=1$, $K=0$, makes $Q=1$, i.e set state.

Case 3: $J=0, K=1$

i) When $J=0, K=1, Q=0, S=0, R=0$, since $SR=0$, there is no change in the output i.e $Q=0$, $\bar{Q}=1$

ii) $Q=1$, $\bar{Q}=0$: When $J=0, K=1, Q=1, S=0, R=1$. According to truth table of SR flip flop it is a reset state i.e output will be 0

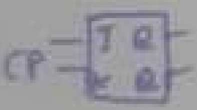
The inputs $J=0$, $K=1$ makes $Q=0$ Reset State

Case 4: J=K=1

i) when J=K=1 & Q=0, S=1, R=0 According to the truth table of SR flip-flop it is in set state & output Q will be 1

ii) when J=K=1, Q=1, S=0, R=1. According to the truth table of SR flip-flop. it is in reset state & output Q will be 0

The input J=K=1, toggles the flip flop output.

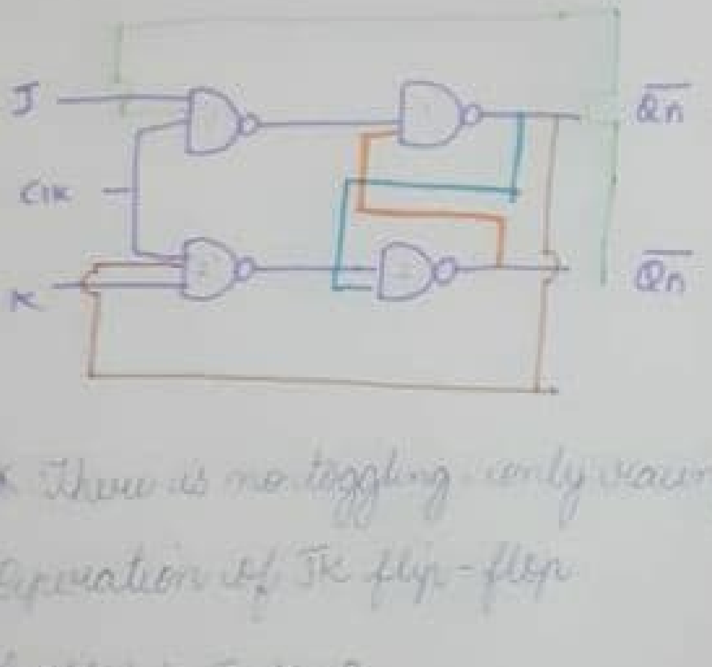


Q_n	J	K	Q_{n+1}
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

=

J	K	Q_{n+1}
0	0	Q_n
0	1	0
1	0	1
1	1	$\bar{Q}_n$

Explain about the operation of JK flip flop



* There is no toggling only racing

Operation of JK flip-flop

Case 1 : J=K=0

when J=K=0, S=R=0 and according to truth table of SR flip flop, there is no change in the output

when inputs J=K=0, outputs does not change

Case 2 : J=1, K=0

when J=1, K=0 ; Q=0, S=1, R=1

According to TT of SR flip flop it is set

13 Difference between BJT and FET

Bipolar Junction Transistor	Field Effect Transistor.
* A bioplar transistor requires a small amount of current flowing to keep the transistor on. While the current for one transistor may be negligible, it adds up when millions are switching simultaneously. The heat dissipated on biopolar limits the total number of transistors that can be built on the chip.	* once the gate terminal on an FET has been charged, no more current is needed to keep that transistor on for the duration of time required
* A BJT will consume more power in the on state it can't switch with less than a 0.3V voltage drop	* FETs are prefered wide line or load variation & have low power consumption.
* BJTs function as regulators of currents as small current is regulating a large current	* FET function as voltage regulators ic co-efficient, stopping thermal runway.
* BJTs are preferred for low current applications	* FETs are preffed in Low-voltage application (less than 250V)
* The bioploar transistor is liable for thermal runway due to a negative temperature co-efficient	* FET have a positive temperature co-efficient, stopping thermal run way.
* BJTs are used where we need high gain & fast response	* FETs have low medium gain
* BJT's are relatively greater in size than FET of same rating	* FETs are smaller in size so area consumption of FET is less so less made by FET's provides higher Packing density as compared to BJT's

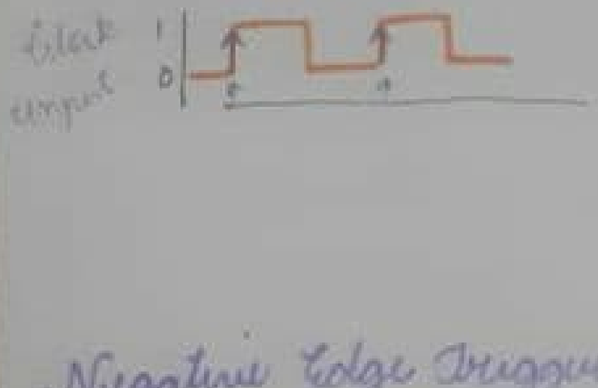
Forward biased junction diode

When a diode is connected in a forward bias condition, a negative voltage is applied to N-type material and a positive voltage is applied to the P-type material. If this exetornal voltage becomes greater than the value of the potential barrier, approx.

0.7 volts for silicon and 0.3 volts for germanium, the potential barriers

Positive Edge Triggering :

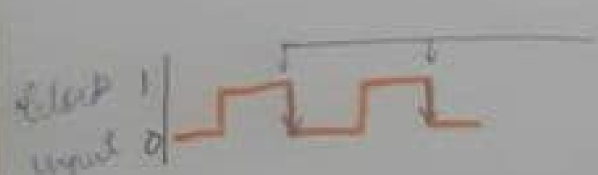
Here, the output responds to the changes in the input only at positive edge of the clock pulse at clock input



Output responds only at the +ve edge of the pulse

Negative Edge Triggering :

Here, the output responds to the changes in the input only at the negative edge of the clock input



Output responds only at -ve edge of the pulse

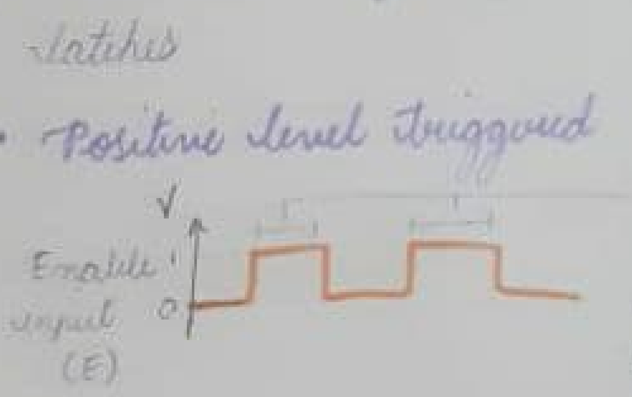
What is level triggering & edge triggering

Level Triggering: In level triggering, the output state is allowed to change according to input

* It happens when active level is maintained at the enable input

* There are 2 types of level triggered latches

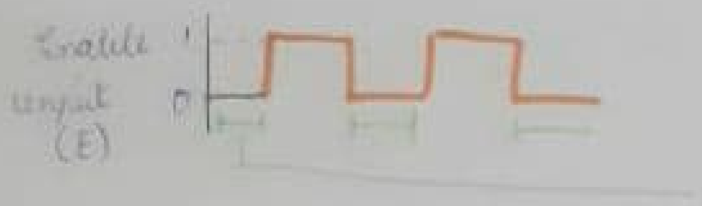
• Positive level Triggered



Flip flop is enabled only when the level of E input is high

* The Output of the flip flop responds to the input changes only when its enable input is 1 (HIGH)

Negative level triggered



Flip flop is enabled only when the ~~le~~ level of E input is LOW

The output of the flip-flop responds to E the input changes only when its enable input is 0 (LOW)

Edge triggering:

* In edge triggering, the output responds to the changes in the input only at +ve or -ve of the clock pulse at clock input. There are of 2 types

Q) Draw and explain gated-latch logic diagram

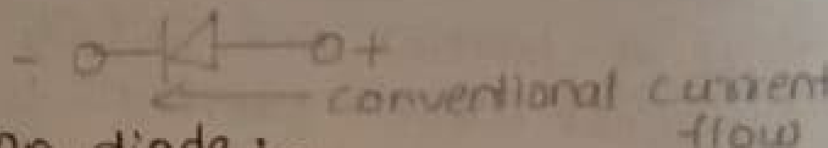
(OR)

Draw the logic diagram of SR latch with control input using NAND gates

* In SR latch output changes occur immediately after the input changes occur
* i.e the latch is sensitive to S & R inputs all the time
* It can be easily modified to create a latch that is sensitive to these inputs only when enable input is active
* Such a latch will enable input known as gated SR latch
* The table shows the truth table for gated latch
* The circuit behave like a SR latch when EN=1

20/08/20 # Unit-1 DIODES AND APPLICATIONS

Diode:- A diode is a two-terminal electronic component that conducts current primarily in one direction.
The positive side of the diode is called anode, and the negative one is called cathode.



PN Junction diode:-

→ In a piece of semiconductor, if one half is doped by P-type impurity and the other half is doped by n-type impurity, a PN junction is formed.

→ The plane dividing the two halves or zones is called PN junction.

→ The n-type material has high concentration of free electrons, while p-type material has high concentration of holes.

→ There is a tendency of free electrons to diffuse over to the p side and the holes to the N side. This process is called diffusion.

→ As the free electrons move across the junction from N type to P type, the donor atoms become positively charged. Hence a positive charge is built on the N-side of the junction

→ The free electrons that cross the junction uncover the negative uncover the negative acceptor ions by filing the holes. Therefore a negative charge on the p side prevents further diffusion of electrons into the p side

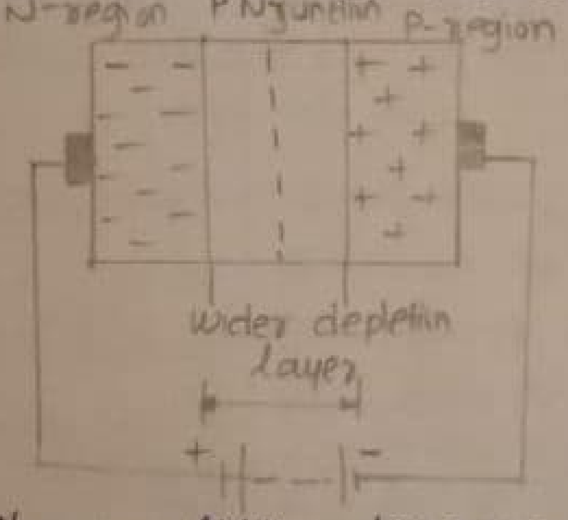
→ Similarly the net positive charge on the N side repels the hole crossing from P side to N side.

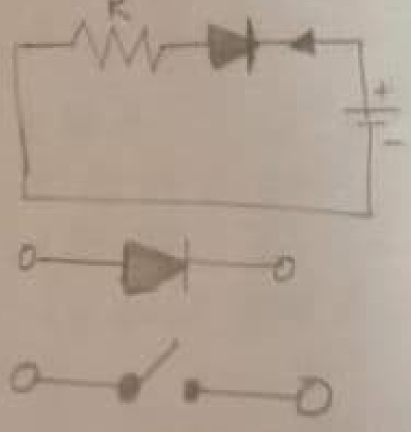
→ Thus a barrier s is set up near the junction which prevents the further movement of charge carriers i.e electrons and holes.

→ An electrostatic potential difference is established between P and n regions which are called the potential barrier junction barrier, diffusion potential or contact potential Vo varies with doping levels and temperature.

→ Vo is 0.3V for Ge and 0.72 V for Si

the holes in the p-type end are also attracted away from the junction towards the negative electrode.
The net result is that the depletion layer grows wider due to a lack of electrons and holes and presents a high impedance path, almost an insulator.
The result is that a high potential barrier is created thus preventing current from flowing through the semiconductor material



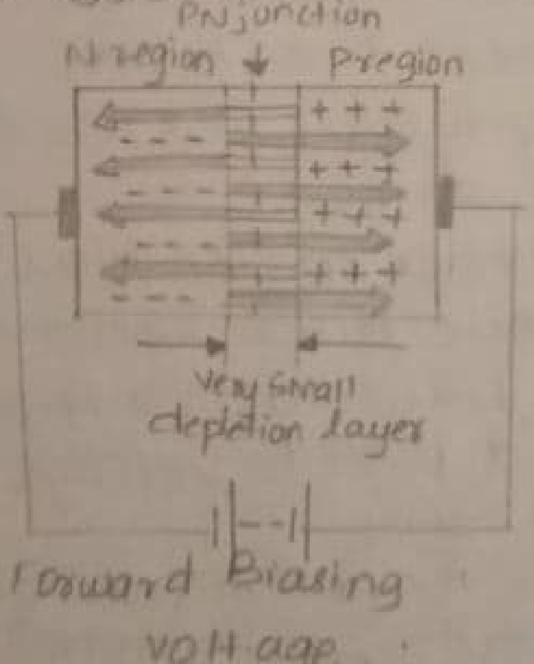


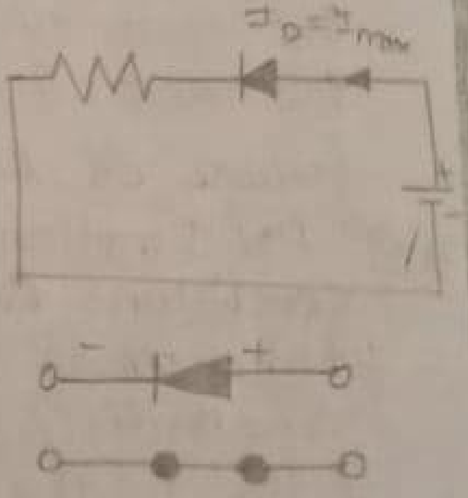
The condition represents a high resistance value to the PN junction and practically zero current flows through the junction diode with an increase in bias voltage However, a very small leakage current does flow through the junction which can be measured in microamperes (μA) If the reverse bias voltage V_r applied to the diode is increased to a sufficiently high enough value it will cause the

the application of a forward biasing voltage on the junction diode results in the depletion layer becoming very thin and narrow which represents a low impedance path through the junction thereby allowing high currents to flow

The point at which this sudden increase in current takes place is represented on the static I-V characteristics curve above as the "knee" point.

Forward biased Junction Diode showing a Reduction in the Depletion layer





This condition represents the low resistance path through the PN junction allowing very large currents to flow through the diode with only a small increase in bias voltage.

Implement a full adder using 2 half adders.

* A full adder can also be implemented with 2 half adders & one OR gate

* The sum output from second half adder is the exclusive-OR on Cin & output of the first half adder

$$
\begin{aligned}
C_{out} &= AB + AC_{in} + BC_{in} \\
&AB + AC_{in}(B+\bar{B}) + BC_{in}(A+\bar{A}) \\
&AB + ABC_{in} + A\bar{B}C_{in} + ABC_{in} + \bar{A}BC_{in} \\
&AB(1 + C_{in} + C_{in}) + A\bar{B}C_{in} \quad \bar{A}BC_{in} \\
&AB + A\bar{B}C_{in} + \bar{A}BC_{in} \\
&AB + C_{in} \quad (A\bar{B} + \bar{A}B) \\
&AB + C_{in} \quad (A \oplus B)
\end{aligned}
$$

Q) Implement the given function using Multiplexer $F(x,y,z) = \Sigma(0,2,6,7)$

Step 1 : * Select the Multiplexer

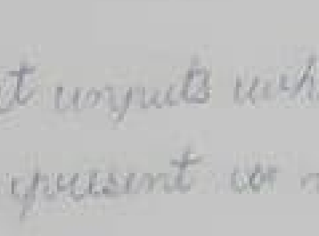
* Here, Boolean expression has 3 variables

* Thus we require $2^3 = 8:1$ multiplexer

Step 2 : * Connect inputs which co-responds to the present or minterms to logic 1

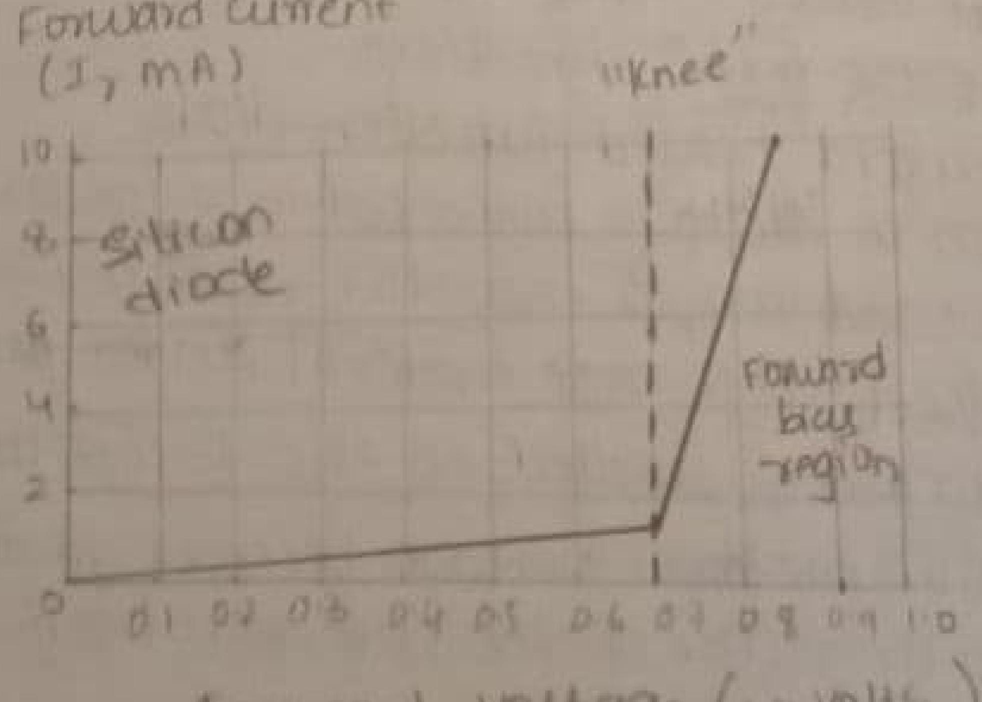
Step 3 :* Connect remaining inputs to logic 0

Step 4 * Connect input variables to select lines of MUX



opposition will be overcome and current will start to flow.
This is because the negative voltage pushes or repels electrons towards the junction giving them the energy to cross over and combine with the holes being pushed in the opposite direction towards the junction by the positive voltage.
This results in a characteristics curve of zero current flowing up to this voltage point, called the "knee" on the static curves and then a high current flow through the diode with little increase in the external voltage.

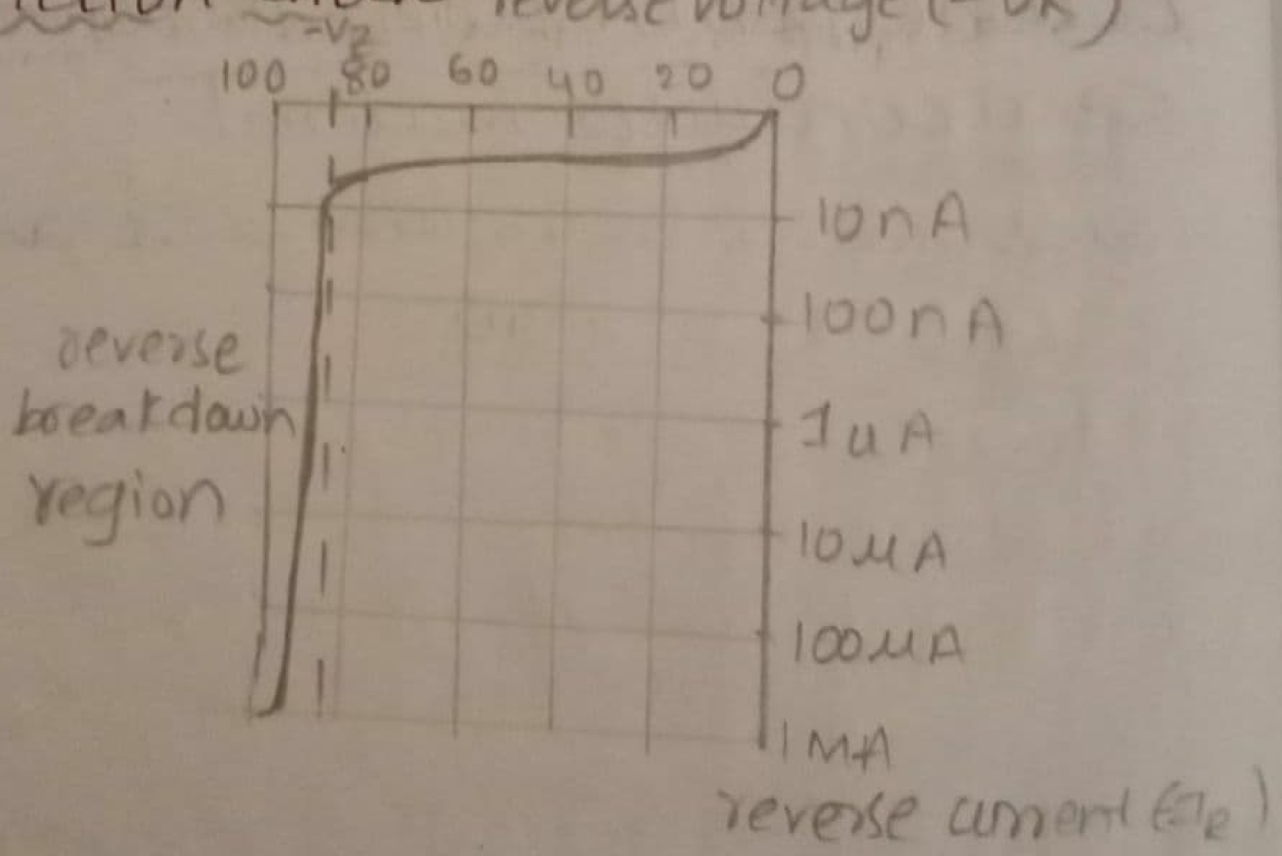
Forward characteristics curve for a Junction diode



PN junction to overheat and fail due to the avalanche effect around the junction.

- This may cause the diode to become shorted and will result in the flow of maximum circuit current, and this shown as a step downward slope in the reverse static characteristics curve.

Reverse characteristics curve for a Junction diode



dQ - change in charge stored in depletion region.

7) The diffusion capacitance at low frequencies is given by the formula

$$\boxed{C_D = T^* \frac{g}{2} \quad \text{(low frequency)}}$$

8) The diffusion capacitance at high frequencies is inversely proportional to the frequency & is given by the formula:

$$\boxed{C_D = g\left(\frac{t}{2\omega}\right)^{1/2}}$$

diffusion capacitance

1) Diffusion capacitor is the capacitance due to transport of charge carriers b/w two terminals of a device

2) It is denoted by c_D

3) It occurs in FB diode electrons and holes near depletion region

4) The change in charge w.r.t voltage results in capacitance called diffusion capacitance

5) Diffusion capacitance is directly proportional to electric current or applied voltage

6) In FB, the diffusion capacitance is the dominant and is given by

$$c_D = \frac{dQ}{dV} = \tau \frac{dI}{dV} = \tau g = \frac{\tau}{r}$$

c_D - diffusion capacitance
g - diode conductance
r - diode resistance
τ - time interval for change in voltage
V - change in applied voltage

The actual potential difference across the junction or diode is kept constant by the action of the depletion layer at approximately 0.3V for germanium, and approximately 0.7V for silicon junction diodes.
Since the diode can conduct "infinte" current above this knee point as it effectively becomes a short circuit, therefore resistors are used in series with the diode to limit its current flow.
Exceeding its maximum forward current specification causes the device to dissipate more power in the form of heat than it was designed for resulting in a very quick failure of the device.

31/5/20 PN Junction Under Reverse bias Condition:- Reverse biased Junction diode

When a diode is connected in a Reverse bias condition, a positive voltage is applied to the N-type Material and a negative voltage is applied to the p-type material.
The positive voltage applied to the N-type material attracts electrons towards the positive electrode and away from the junction, while

UNIT - 1 continution.

Diode resistance·

1. A PN Junction diode is a unidirection two-terminal semiconductor device.
2. It conducts only in one direction and offer high resistance in other direction
3. In Ideal diode offers zero resisto when FB and infinite resistance when it is reversed bias
4. In practical diode it does not offer zero resistance when FB and Infinite resistance in reverse bia
5. Diode resistance is the resistance which a diode offers in a Circuit
6. Diodes are not linear devices.
7. The resistance of diodes does not vary directly and proportiona to the amount of voltage & current applied to them.

Symbol 

8. Resistance can be calculated by the formula $\boxed{R = \frac{V}{I}}$

Applications
- used in solar cell panels.
- used in logic circuits
- used in the detenction circuits
- used in character recognition circuits
- used in exact measurement of the intensity of light in science & industry
- Photodiodes are faster and more complex than normal PN junction diode and hence are frequently used for lighting regulation and optical communication

Photodiode

A photodiode is a pn junction diode that consumes light energy to produce electric current. They are also called a photo detector, a light detector, and a photo-sensor. photodiodes are designed to work in reverse bias condition.

Typical photodiode material are silicon, Germanium and Indium gallium arsenide.

Symbol of photodiode

The symbol of the photodiode is similar to that of an LED, but here the arrow points inwards

Working

A photodiode is subjected to photons in the form of light which affects the generation of electron hole pair the falling photons If the energy of the energy gap is greater than the energy of the s.c material, electron hole pairs are created near the depletion region of the diode.

The electron hole pair created are seperated from each other before

Transition Capacitance.

1) The amount of capacitance changed with increase in voltage capacitance is called Transition capacitance

2) The transition capacitance is also known as depletion region capacitance, junction capacitance

3) It is denoted as C_T

Tunnel diode is a two terminal PN junction

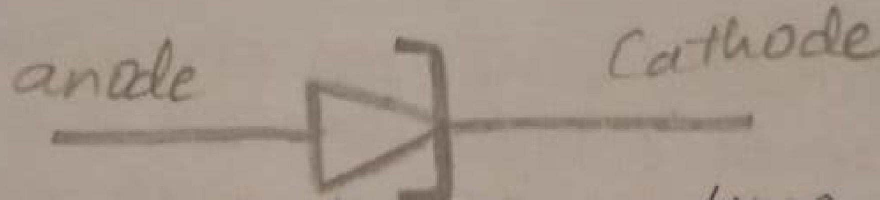
A Tunnel diode is a heavily doped pn junction diode in which electric current decreases as the voltage increases.

In tunnel diode, electric current is caused by "Tunneling".

The tunnel diode is used as a very fast switching device in computers.

It is also used in high frequency oscillators and amplifiers

Symbol



In tunnel diode, the p type s.c act as anode and n type s.c act as cathode.

We know that a anode is a +vely charged electrode which emits electrons

N type s.c emits or produces electrons so it is refered to as cathode.

P type s.c attracts electron emitted from the n type s.c so p type s.c is reffered to as the anode.

4) The capacitance which appears b/w positive ion layer in n-reg and negative ion layer in p-regi

5) The transition capacitance is very small as compared to the diffusion capacitance

6) In reverse bias, the capacitance is the dominant and is given by:

$$\boxed{C_T = \epsilon \cdot \frac{A}{W}}$$

Where C_T = transition capacitance

A - diode cross sectional area

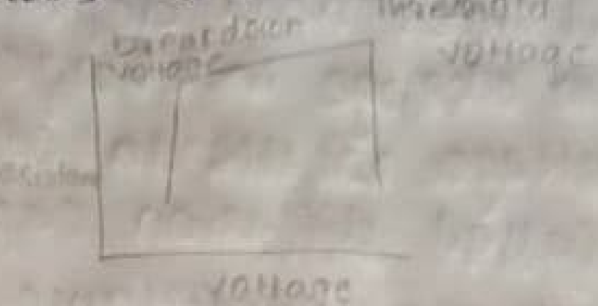
W - depletion region width.

9 Diodes are non linear

10 Diodes are s.c devices doped with impurities, they do not function like linear devices.

11 The resistance changes based on voltage and current that fall across them.

Graph.



12 The diode has two key resistance they are breakdown voltage and threshold voltage

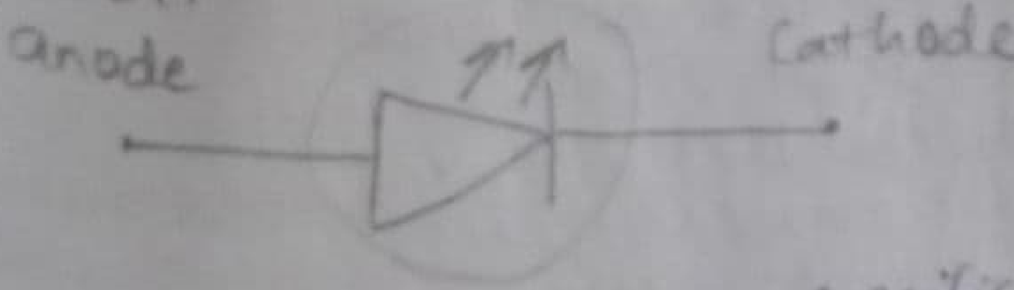
13 Diode resistance $R = \frac{V_T}{I_d}$

14 diode resistance is equal to thermal voltage, V_T divided by the current I_d passing through diode

15 The thermal voltage of the diode is approximately 25mV at 300K which is room temperature

where k is Boltzmann constant

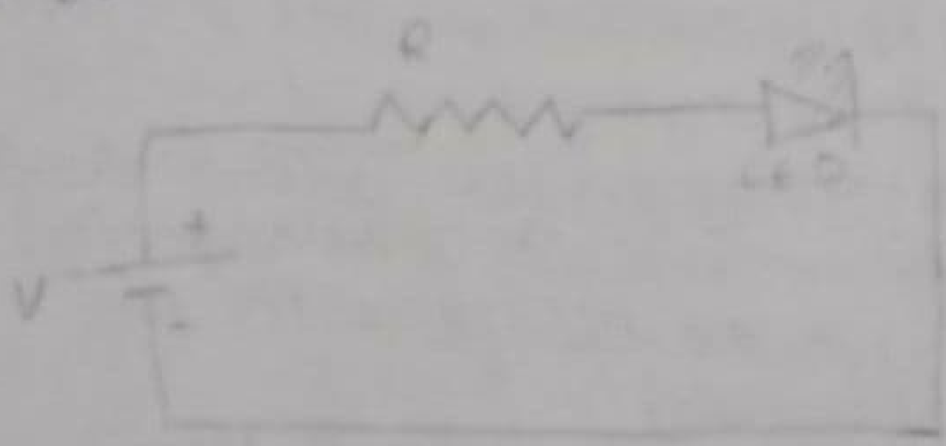
ymbol.



The LED's also have a specific drop in voltage forward in cases when it is used typical circuits like a conventional diode.

The drop in voltage depends on the current of the LED, the colour produced light, etc.

There are different values in the drop of voltage that would vary from 1.5V to 2.5V current for 10 to 50 mA current.



LED circuit

Working

The holes in the VB and free electrons in CB. when there is a FB in the pn junction, the electron which is

recombining due to the eletric field of the junction.
The direction of the eletric field in the forces the electron to move towards the n side and consequently the holes move towards the p side.
As a result of the increase in the number of electrons on the n side and holes on the p side a rise in the eletromotive force are observed.
The magnitude of the electro ~~magnitude~~ motive force created depends directly upon the intensity of incident light.
This effect of the proportional change in photocurrent with the change in light intensity can be easily ~~is~~ obseved by applying a reverse bias.

Built in lenses and optical filters may be used to enhance the power and productivity of a photodiode.

a part of the n type s.c material would over run the pn junction & join with the holes in the ptype s.c material Therefore the free electron would be at higher energy bands.
In LED, energy discharged in light form hinges on the forbidden energy gap. The color and wavelength of the light emmited can be determined by doping it will several impurities

Uses

used in optical communication
alarms, robotics.
used for TV back lighting
uses in displays
used in automotive
used in the dimming of lights.

LED

Led converts ~~light energy into~~ electrical energy into light energy when current passes through the LED, the electrons recombine with holes emitting light in the process.
It is a specific type of diode having similar characteristics as the p-n junction diode. LED is heavily doped PN Junction diode
This means that an LED allows the flow of current in its forward direction while it blocks the flow in the reverse direction.
Light emitting diodes are built using a weak layer of heavily doped S.C material.
An LED will emit a colored light at a particular spectral wavelength when F-B

Advantages
long life, low noise, Low power consumption, High speed operatio

Disadvantages
Tunnel diode cannot be fabricated in large number
. Being a two terminal device, the input and output are not isolate from one another

Applications of tunnel diode
Tunnel diodes are used as logic
→ memory storage devices.
→ used in relaxation oscillator circuit
→ used as an ultra high speed switch
→ used in fm receivers

Diode switching Times

While changing the bias conditions the diode undergoes a transient response.

The responce of a system to any sudden change from an equilbrium position is called transient response

The sudden change from forward to reverse and from reverse to forward bias, affect the circuit

The time taken before the diode recovers its steady state is called as Recovery time.

The time interval taken by diode to switch from RB to FB state is called as Forward recovery time

The time interval taken by the diode to switch from FB state to RB state is called Reverse recovery time.

→ For all the positive half cycles of input AC signal the diode D_1 is the forward bias and it conducts current Now the diode D_2 is in reverse bias and it does not conduct current

→ For all the negative half cycles of input AC signal the diode D_2 is in forward bias and it conducts current Now the diode D_1 is in reverse bias and does not conducts current

→ Both positive and negative halfcycles of input AC signal are converted into rectified DC output.

→ The ratio of output DC power to input AC power is called efficiency of full wave rectifier.

$$\eta = \frac{0.812 R_L}{r_f + R_L}$$

→ The maximum efficiency of full wave rectifier is 81.2%.

- The ratio of output DC power to input AC power is called efficiency of half wave rectifier

$$\eta = \frac{\text{output DC power}}{\text{input AC power}} = \frac{0.406 R_L}{r_f + R_L}$$

where R_L = Load resistance
r_f = forward resistance of diode

- Maximum efficency of half wave rectifier is 40.6%

and maintains the voltage across the load current.

6) Applying KCL at the node we get $I = I_L + I_Z$

7) voltage across the load resistance is given as

$V_L \rightarrow$ load voltage

$V_Z \rightarrow$ Zener voltage

$$V_L = V_Z + I_Z R_Z$$

8) zener diode are available in the range of 2V to 200 V

9) The breakdown voltage is different from the one zener diode to another zener diode. because of different doping concentration.

10) Limitations

The circuit is used only when the changes in the load current and line voltage are small.

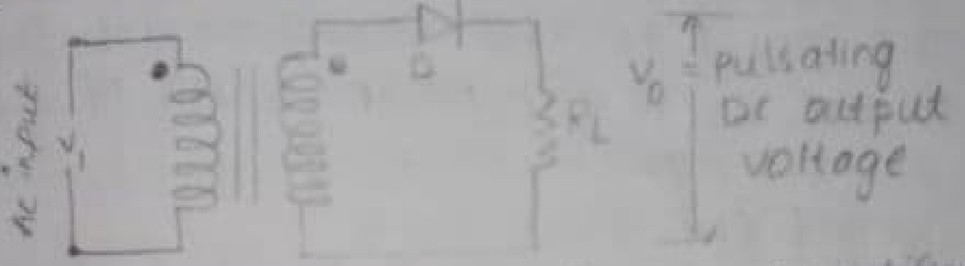
5/9/20 Classification of rectifiers

using one or more diodes in the circuit, following rectifiers circuits can be designed

1) Half wave rectifier
2) Full wave rectifier
3) Bridge Rectifier

Half wave rectifier

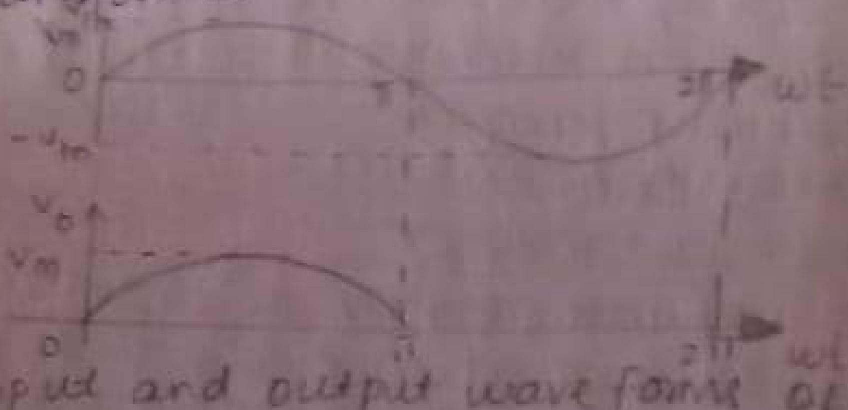
A Half wave rectifier as shown in fig. The device which converts ac voltage into a pulsating voltage using only one half cycle of the applied ac voltage



Basic structure of half wave rectifier

- A half wave rectifier can be constructed with a single p-n junction diode.
- The input AC signal to be rectified is applied across the primary of the transformer and output DC signal is taken across the load resistance (R_L) connected across secondary.
- The ac voltage is applied to the rectifier circuit using step down T/F rectifying element i.e p-n junction diode and the source of ac voltage all connected in series.

- The ac voltage is applied to the rectifier circuit using step down transformer



Input and output wave forms of a half wave rectifier

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

- The input to the rectifier circuit, where V_m is the peak value of secondary ac voltage

Operation:

- For all the positive half cycles of input AC signal, the diode D is in forward bias and hence it conducts current. So current passes through load resistance (R_L)
- For all the negative half cycles of input ac signal, the diode D is in reverse bias and it does not conduct current. So no current flows through load resistance (R_L)
- Only positive half cycle of input AC signal is converted into rectified DC output.

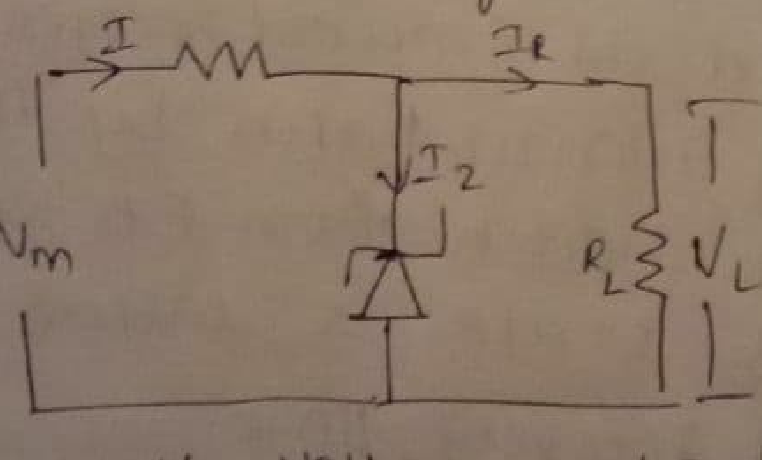
Zener Diode.

1) A properly doped PN junction diode which has sharp breakdown voltage is called a zener diode

2) zener diode can be used as voltage regulator by connecting it in R.B.

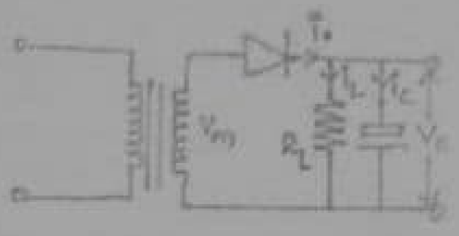
3) Symbol 

4) A zener diode can be used a a voltage regultor to provide constant voltage from a source whose voltage may vary over sufficient range



5) The i/p voltage v to the zener regulator is greater than breakdown voltage v' the diode function In the zener region

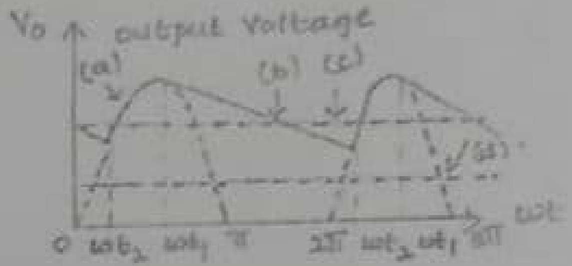
APACITOR FILTER WITH HWR



Cut in angle = Wt_2

Cut out angle = Wt_1

$Wt_1 = \pi - \tan^{-1} WCR_L$



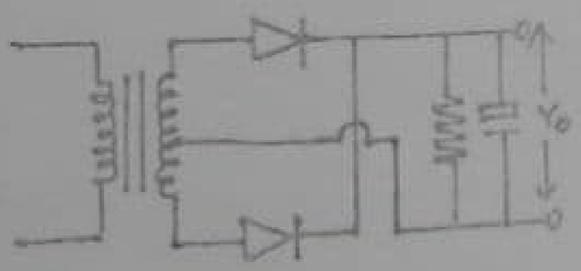
(a) Capacitor charging through diode ($Wt_2 - Wt_1$)

(b) Capacitor discharging through R_L (Wt_1 to Wt_2)

(c) Average (DC) voltage with fitter

(d) Average (DC) voltage without fitter.

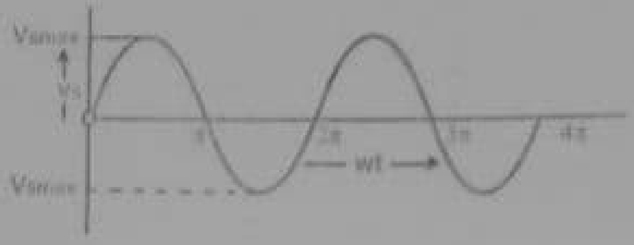
CAPACITOR FILTER WITH FWR



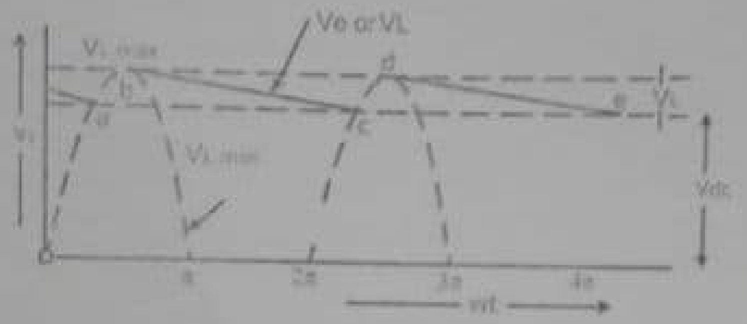
n be offers high Impedance to the dc
as component.

b) The ripples get passed through
oss Capacitor c and only dc component
flow through the load resistance R_L

Diagrams in pdf



Input voltage Waveform to Rectifier



Rectified and filtered Output Voltage Waveform

Load Current Waveform

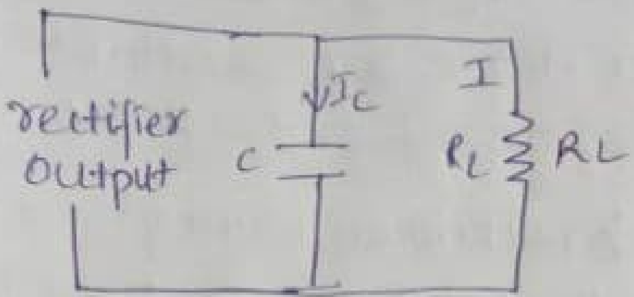
Half-wave Rectkier With Shunt Capacitor Filter

CircuiNToday.com

Rectifier with Capacitor filter.

1) The designing of this circuit can't done with a capacitor as well as load resistor

2) The rectifier voltage is give across the terminal of a capacitor



3) The function of a capacitor filter may be viewed in terms of impedance.

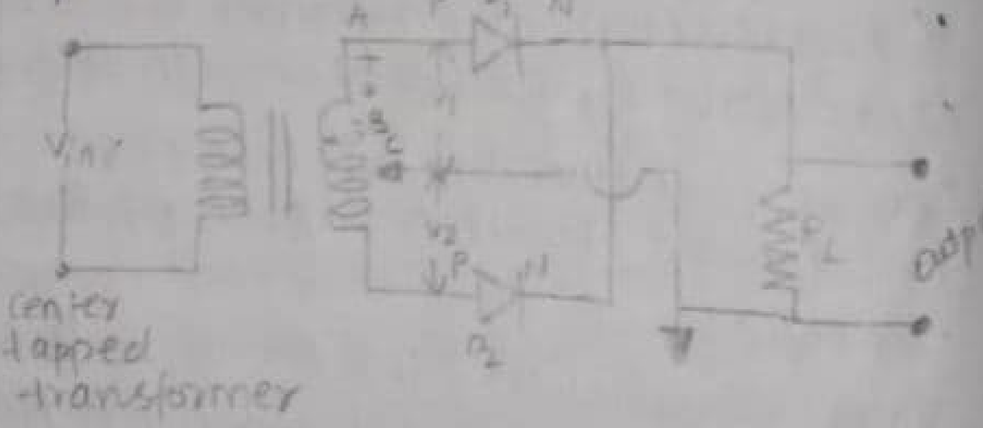
4) The large value of capacitor C offer low impedance.

5) Capacitor filter is very popular because of its low cost, small size, light weight and good characteristics.

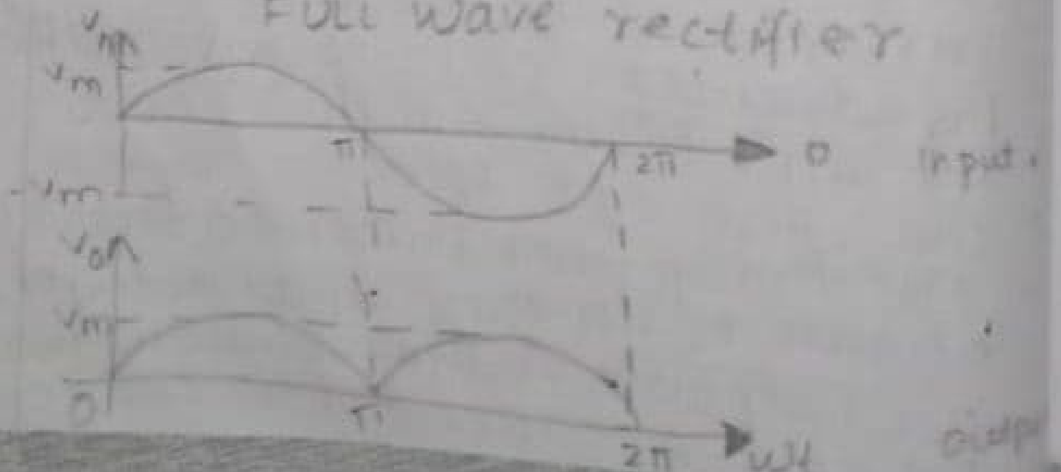
5) The capacitor C offers low impedance shunt path to the ac components or ripples but

7/9/20 Full Wave Rectifier :-

- A full wave rectifier converts an ac voltage into a pulsating dc voltage using both half cycles of the applied ac voltage.
- In order to rectify both the half cycles of ac input, two diodes are used in this circuit.
- the diodes feed a common load R_L with the help of a center-tap transformer.
- A center tap transformer is the one which produces two sinusoidal wave forms of same magnitude and frequency but out of phase with respect to the ground in the secondary winding of the transformer.



Full wave rectifier



Analog and Digitial Electronics

Unit - I

1) PN Junction diode.
2) Diode resistance
3) diffusion capacitance
4) diode switching times.
5) Tunnel diode
6) photodiode
7) LED
8) zener diode.
9) Half wave rectifier
10) Full wave rectifier
11) capacitor filter.