UNIT I
PN Junction Diode

SHORT ANSWER QUESTIONS (PART-A):

1.What are solid state materials?

Materials where atoms are arranged in a fixed, structured pattern, like semiconductors used in electronics.

2.What is Doping?

Adding impurities to a semiconductor to alter its electrical properties.

3.What is P-type and N-type semiconductor?

P-type has more holes (positive charge carriers); N-type has more electrons (negative charge carriers).

4.What is Diffusion?

Movement of particles from an area of high concentration to low concentration.

5.What is meant by depletion region?

Region near a PN junction where no free charge carriers exist due to recombination of electrons and holes.

6.Define Knee voltage/cut-in voltage of a conventional diode.

Minimum voltage required for a diode to start conducting significantly.

7.What is reverse breakdown voltage?

Voltage at which a diode starts conducting heavily in reverse bias, often causing damage.

8.State Reverse saturation current.

Small current flowing through a diode when it is reverse biased.

9.Draw forward bias and reverse bias of PN junction diode circuits.

Forward Bias:

Reverse Bias:

10.Define the Static and Dynamic Resistances of a PN Junction diode.

Static Resistance: Resistance at a specific operating point.

Dynamic Resistance: Change in voltage with respect to change in current around that operating point.

11.Write down the equation of PN Junction diode current.

$$I = I_S(e^{\frac{V}{nV_T}} - 1)$$

12.Draw the ideal and practical equivalent circuit of PN Junction diode.

Ideal Circuit:

Practical Circuit:

13.Define Transition and Diffusion Capacitances of a PN Junction diode?

Transition Capacitance: Due to the depletion region.

Diffusion Capacitance: Due to charge carrier movement.

14.What are the applications of PN Junction diode?

Used in rectifiers, signal demodulation, voltage regulation, and protection circuits.

15.Diode is a bidirectional device (True or False)

False

16.A reverse-biased diode has _____ resistance

High (very large) resistance.

17.A forward biased diode has _____resistance

Low (very small) resistance.

18.Why diode is called a switch?

It can control the flow of current like a switch, allowing current in one direction only.

19.Define Storage time and Transit Time?

Storage Time: Time taken to remove excess minority carriers from the base region.

Transit Time: Time for charge carriers to cross the base region.

20.Define Reverse Recovery time?

Time taken for a diode to stop conducting in reverse bias after it has been forward biased.

UNIT II

DIODE APPLICATIONS
SHORT ANSWER QUESTIONS (PART-A):

1.What are the applications of PN Junction Diode?

Used in rectifiers, voltage regulators, signal demodulators, and protection circuits.

2.What is meant by rectifier?

A device that converts alternating current (AC) to direct current (DC).

3.List different types of rectifiers?

Half-wave, full-wave, and bridge rectifiers.

4.Define Peak Inverse Voltage of a diode?

The maximum voltage a diode can withstand in reverse bias without breaking down.

5.Define rms voltage of a rectifier?

The root mean square value of the output voltage, representing its effective value.

6.Define average voltage of a rectifier?

The average value of the rectified output voltage over a complete cycle.

7.What is a ripple factor?

A measure of the residual AC component in the rectified output, defined as the ratio of the ripple voltage to the DC voltage.

8.Define regulation of a rectifier?

The ability of a rectifier to maintain constant output voltage despite changes in load current.

9.State transformer utilization factor?

The ratio of the DC power delivered to the load to the AC rating of the transformer secondary.

10.Define efficiency of a rectifier?

The ratio of the DC power output to the AC power input, indicating how effectively the rectifier converts AC to DC.

11.Compare 3 types of Rectifiers?

Half-wave: Converts half of the AC cycle, lower efficiency.

Full-wave: Converts both halves of the AC cycle, higher efficiency.

Bridge: Uses four diodes, efficient, no center-tap required.

12.What is the need for a filter in rectifier?

To reduce the ripple and provide a smoother DC output.

13.Write ripple factor of capacitor filter?

$$\frac{1}{2\sqrt{3}fR_LC}$$

14.Write ripple factor of inductive filter?

$$\frac{V_m}{2\sqrt{3}fL}$$

15.What is a clipper?

A circuit that removes or "clips" a portion of the input signal without distorting the remaining part.

16.What is the other name of clipper?

Limiter

17.What is a transfer characteristic?

A graph showing the relationship between the input and output of a circuit.

18.Why clamper is called dc restorer?

It shifts the DC level of a signal without changing its shape, restoring the original DC component.

19.What is non linear wave shaping?

Modifying the waveform of a signal using non-linear components like diodes and transistors.

20.What is the difference between the clipper and clamper?

Clipper: Removes parts of the signal above or below a certain level.

Clamper: Shifts the entire signal up or down to a different DC level.

UNIT III

Bipolar Junction Transistor (BJT)
SHORT ANSWER QUESTIONS (PART-A):

1.What is a transistor?

A semiconductor device used for amplification and switching electronic signals.

2.Describe the main function of the transistor.

To amplify current or act as a switch in electronic circuits.

3.Why is the transistor called as bipolar junction transistor?

It consists of two types of semiconductor materials (p-type and n-type) forming junctions.

4.What are the doping levels in the transistors?

Heavy doping in emitter, moderate in base, and light doping in collector.

5.What are the three types of configuration in transistors?

Common emitter (CE), common base (CB), and common collector (CC).

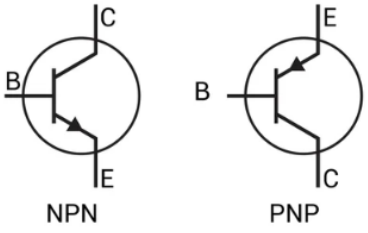
6.Why is the emitter region wider than the collector region in BJT?

To ensure efficient injection of majority carriers (electrons for NPN, holes for PNP).

7.Define Transistor current.

Current flowing through a transistor due to the movement of charge carriers.

8.Draw the symbol of npn and pnp transistor.



9.Define the different operating regions of transistor.

Cutoff (no current), active (amplification), saturation (maximum current).

10.Draw the input and output characteristics of a transistor in CE configuration and mark the cutoff, saturation and active regions.

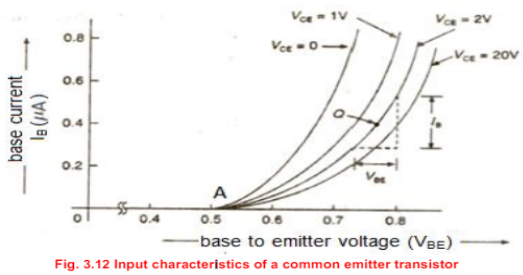


Fig. 3.12 Input characteristics of a common emitter transistor

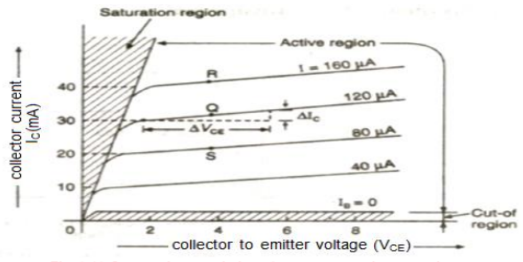


Fig. 3.13 Output characteristics of a common emitter transistor

11.What is early effect or basewidth modulation?

The phenomenon where increasing collector-base voltage reduces the base width, affecting transistor performance.

12.Explain how transistor acts as an open switch and closed switch.

Open switch (cutoff): No collector current flows.

Closed switch (saturation): Maximum collector current flows.

13.Explain current amplification factor.

Ratio of collector current to base current (β for common-emitter configuration).

14.What are α, β and γ in a transistor?

α (alpha): Current gain ratio of collector current to emitter current.

β (beta): Current gain ratio of collector current to base current.

γ (gamma): Current gain ratio of emitter current to base current.

15.What is the relation between α, β and γ in a transistor?

α = β / (1 + β)

16.What is ICBO and ICEO in a transistor what is relation between ICEO, ICBO and ICO?

ICBO: Collector cutoff current.

ICEO: Emitter cutoff current.

ICO = ICBO + ICEO

17.Why ICBO is greater than ICO?

ICBO includes leakage current due to minority carriers.

18.What is meant by collector leakage current in a transistor?

Small current that flows from collector to emitter when the transistor is in cutoff or reverse bias.

19.Describe the main factors affecting the value of collector leakage current.

Temperature, doping levels, and transistor construction.

20.In a BJT, the emitter current is 12 mA and the emitter current is 1.02 times the collector current. Find the base current.

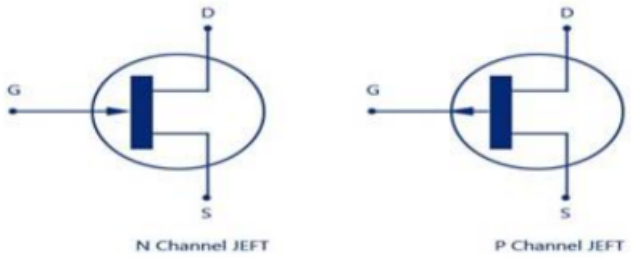
Base current $I_B = \frac{I_E}{1+\beta}$. Given $\beta \approx 50$ (assuming typical value),

$I_B = \frac{12\,\text{mA}}{1+50} \approx 0.24\,\text{mA}.$

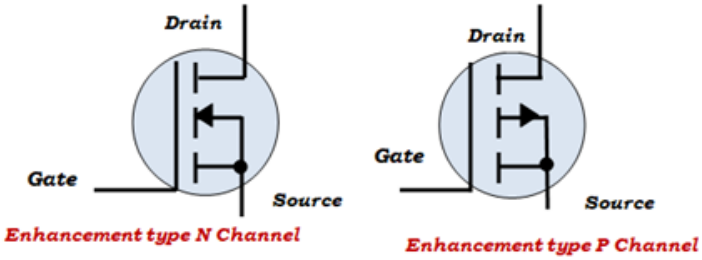
UNIT IV

FIELD EFFECT TRANSISTOR (FET)
SHORT ANSWER QUESTIONS (PART-A)

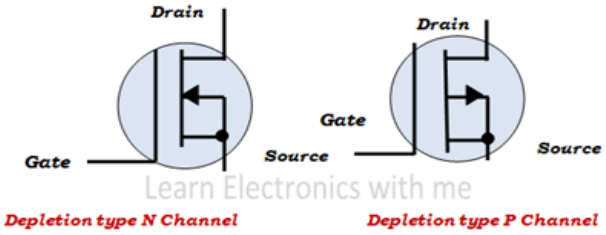
1.Draw the symbols of N-Channel JFET, P-Channel JFET.



2.Draw the symbols of N-Channel E-M



3.Draw the symbols of N-Channel D-MOSFET, P-Channel D-MOSFET.



4.A JFET is also called ..... transistor

Unipolar transistor.

5.JFET is a ..... controlled device

Voltage controlled device.

6.The gate of a JFET is ..... biased

Reverse biased.

7.The input impedance of a JFET is .....

Very high.

8.In a p-channel JFET, the charge carriers are .....

Holes.

9.If the reverse bias on the gate of a JFET is increased, then width of the conducting channel _____

Decreases.

10.When drain voltage equals the pinch-off-voltage, then drain current .....

Decreases with the increase in drain voltage.

11.In a JFET, IDSS is known as .....

Drain to source current with gate shorted.

12.The channel of a JFET is between the .....

Gate and source.

13.The Shockley equation is _____

b) ID = IDSS (1 – Vgs/Vp)

14.The relation between amplification factor(μ), transconductance (gm) and dynamic output resistance (rd) is

a) μ= rd x gm

15.What does MOSFET stands for?

Metal-Oxide-Semiconductor Field-Effect Transistor.

16.With the E-MOSFET, when gate input voltage is zero, drain current is .....

Zero.

17.With a JFET, a ratio of output current change against an input voltage change is called as .....

Transconductance.

18.A MOSFET is sometimes called ..... JFET

Insulated gate JFET.

19.In which MOSFET physical channel exists?

D-MOSFET.

20.The voltage at which the drain current increases in E-MOSFET is called

Threshold voltage (Vth).

UNIT V

SPECIAL PURPOSE DEVICES

SHORT ANSWER QUESTIONS (PART-A)

1.In a Zener regulator, the change in load current produces, change in _____

Zener current.

2.Identify the device that can be used to regulate voltage in an electrical system.

Zener Diode.

3.A zener diode, when used in voltage stabilization circuits, is biased in ____.

Reverse breakdown region.

4.In which of the diode characteristics the negative resistance region is present.

Tunnel Diode.

5.What is Tunneling.

A direct flow of electrons across the small depletion region from n-side conduction band into the p-side valence bande band.

6.___ device has a four layer p-n-p-n construction.

SCR (Silicon Controlled Rectifier).

7.Mention applications of SCR.

Switching, power (AC & DC) control, over-voltage protection, battery charging regulator.

8.Mention the terminals of UJT.

Base1, Base2, Gate.

9.Express the Intrinsic StandOff Ratio(η) of UJT.

$\eta = RB1/(RB1+RB2)$

10.Write any two Applications of Varactor Diode.

Frequency modulation (FM) tuning circuits, phase-locked loops (PLLs).

11.What are the operating regions of UJT?

Cut off region, negative resistance region, saturation region.

12.The presence of dark current decreases the sensitivity of the photodiode to light?

True.

13._____ diode is used to detect the optical signal.

Photo Diode.

14.In a photodiode, when there is no incident light, the reverse current is almost negligible and is called_____.

Dark Current.

15.The colour of emitted light from LED depends on?

Type of semiconductor material used.

16.When forward biased, LED emits light because of_____.

Recombination of carriers.

17.Schottky diodes are also known as_____.

Hot carrier diodes.

18.You have an application for a diode to be used in a FM tuning circuit. A type of diode to use might be_____.

A varactor.

19.The principle of a solar cell is same as the photodiode?

True.

20.What is the difference between Photodiode and Solar cell? (No External Bias in Solar cell)

No External Bias in Solar cell