Mid Term exam

Year not available

1. what is pn junction in simple way. Discuss the behavior of a pn junction under forward and reverse biasing.

Ans: A PN junction is a fundamental component in electronics and semiconductor devices. It's formed by joining two types of semiconductor materials: P-type and N-type.
P-type semiconductor: This type has an excess of positively charged "holes" where electrons are missing, creating positive charge carriers
N-type semiconductor: This type has an excess of negatively charged electrons, creating negative charge carriers.

Forward Biasing:

When a voltage is applied across the PN junction with the positive terminal connected to the P-type material and the negative terminal connected to the N-type material, it's called forward biasing.
This voltage "pushes" the holes from the P-side towards the N-side and the electrons from the N-side towards the P-side.
As a result, a narrow region at the junction becomes depleted of charge carriers, creating a depletion region.
Current flows through the junction due to the movement of charge carriers, allowing the circuit to conduct.
This condition is typically used in diodes and transistors to allow current to pass through.

Reverse Biasing:

When the voltage is applied in the opposite direction (positive terminal to N-type and negative terminal to P-type), it's called reverse biasing.
This voltage increases the depletion region's width as it pushes the charge carriers away from the junction.

In this state, very little to no current flows across the junction since it's acting as an insulator.
Reverse biasing is often used in devices like diodes to block the flow of current when it's not desired.

2.describe the action of the following filter circuits.
Ans:

Capacitor Filter:

A capacitor filter is commonly used in power supply circuits to smooth or filter the output voltage of a rectifier. It's often referred to as a "capacitor input filter."

In a typical configuration, after a rectifier converts AC to DC, a large-value capacitor is connected across the output.

When AC voltage is rectified, it results in a pulsating DC voltage with ripples. The capacitor in the filter circuit charges during the peaks of the voltage and discharges during the troughs.

The action of the capacitor effectively reduces the amplitude of the voltage ripples, creating a more stable and relatively constant DC output voltage.

The larger the capacitance value, the better it filters out the ripples.

Choke Input Filter (LC Filter):

A choke input filter, also known as an LC filter, is another type of power supply filter.

In this configuration, after rectification, a large inductor (choke) is placed in series with the load (typically followed by a smaller capacitor).

The choke's inductance opposes rapid changes in current, so it smooths the incoming pulsating DC current, reducing current ripple.

The capacitor following the choke further filters out any remaining ripples in the voltage.

Choke input filters are known for providing better voltage regulation but have higher voltage drops compared to capacitor filters.

(iii) Capacitor Input Filter (CLC Filter):

A capacitor input filter, often referred to as a CLC filter, combines the characteristics of both a capacitor filter and an inductor (choke) filter.

After rectification, it typically consists of a large-value capacitor followed by an inductor and another smaller capacitor.

The first capacitor, like in a capacitor filter, reduces voltage ripples by smoothing the pulsating DC voltage.

The inductor, similar to a choke input filter, helps reduce current ripple and improve voltage regulation by slowing down changes in current.

The second capacitor further filters and stabilizes the output voltage.

CLC filters provide good voltage regulation and reduced ripple in both voltage and current, making them suitable for high-performance power supplies.

3.write short notes on LED, photo diode and varactor diode.

Ans:

LED (Light-Emitting Diode):

LED is a tiny electronic device that emits light when current flows through it.

It's commonly used in displays, indicators, and lighting.

Comes in various colors, like red, green, blue, and more.

Energy-efficient and long-lasting compared to traditional light bulbs.

Photodiode:

Photodiode is a type of semiconductor diode that converts light into electrical current.

It's used in light sensors, cameras, and optical communication devices.

When light hits it, it produces a small current proportional to the light intensity.

Commonly used in applications requiring light detection.

Varactor Diode (Varicap Diode):

Varactor diode is a special diode whose capacitance varies with the applied voltage.

It's used in tuning circuits of radios and TVs.

Changing the voltage across it changes the diode's capacitance, which alters the frequency of the tuned circuit.

Allows electronic tuning without physically adjusting components.