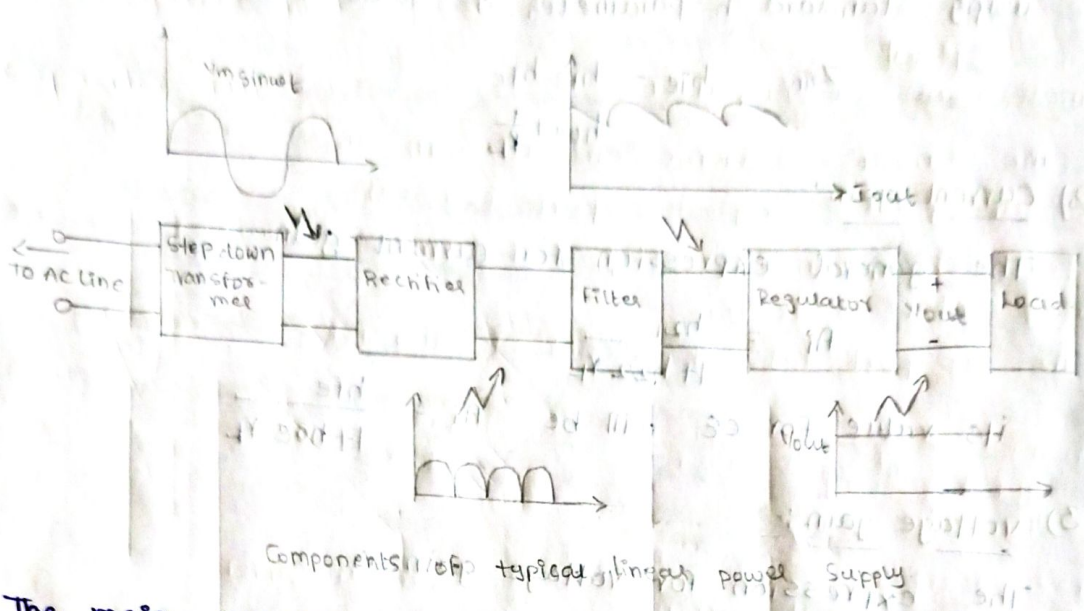
# UNIT-II

## Electronics Circuits and Instrumentation

### Block diagram Description of DC power supply :-




Components of typical linear power supply

- The main purpose of DC power supply is which provide constant DC output voltage.
- The AC signal of 230V, 50 Hz is applied to step down Transformer.
- The Step down transformer, Down the input voltage into lower value.
- The main function of rectifier is which convert AC signal into pulsating DC signal, which consists of DC component as well as AC component.
- By using filter we can eliminate undesired frequencies that are present at the output of rectifier.

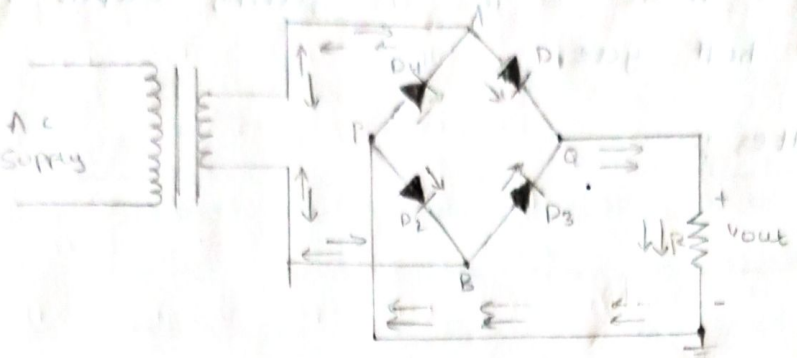
The capacitive reactants

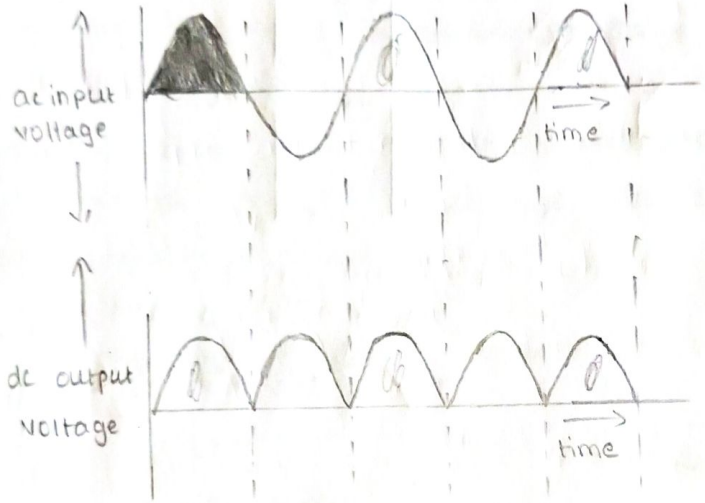
$$X_C = \frac{1}{2\pi f C}$$

- For DC signal frequency $F = 0$ and $X_C$ becomes infinity ($\infty$) which means that the capacitor act as open circuit for DC signal and by pass the DC current.
- For AC signal we have frequency and capacitive reactance becomes decreases i.e., capacitor act as short circuit and will allow AC current.

- Voltage Regulator produces constant DC output voltage even though there is a change in the input supply and change in the load Resistance. (2)
- Here, we are using zener diode as voltage Regulator.

**working of full wave Bridge Rectifier :**



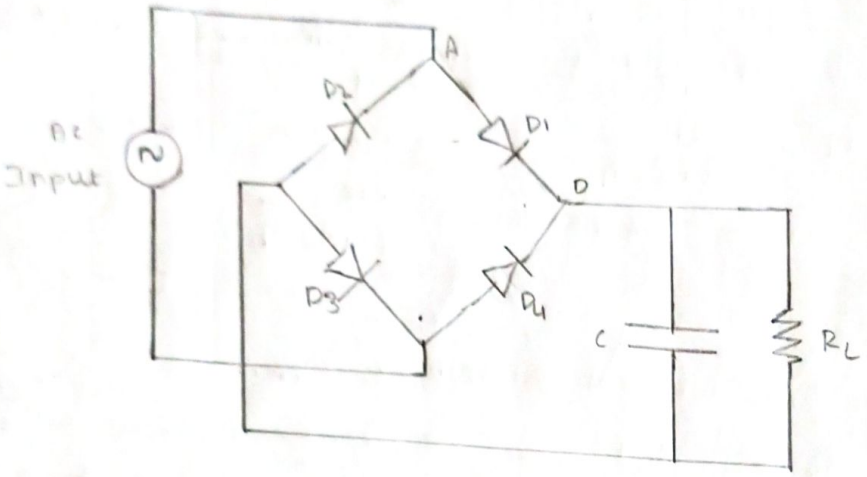

- Here 4 diodes $D_1$, $D_2$, $D_3$ and $D_4$ are arranged in the form of bridge to construct full wave bridge rectifier.
- The AC line voltage of 230 V, 50 Hz signal is applied to step down transformer.
- The transformer down the input voltage into lower value that may be 12 V AC or 24 V AC signal.
- Rectifier convert AC signal into pulsating DC signal which consists of both DC component and AC component.
- During positive half cycle of AC input signal, diodes $D_1$, $D_2$ are in forward Bias where as diodes $D_3$, $D_4$ are in reverse Bias.
- The conducting diodes $D_1$, $D_2$ are in series with load Resistor R and hence current flows in the output circuit.

and we are getting output voltage during positive half cycle.

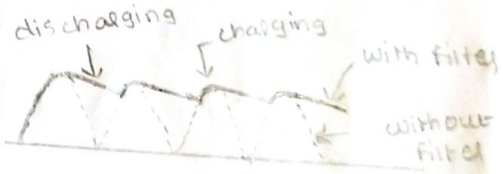
(1)

- For negative half cycle Diodes $D_3$, $D_4$ are in forward bias and these conducting diodes are in series with load Resistor R and form closed circuit. Hence current flows in the output circuit so we are getting output voltage for Negative half cycle.

## Capacitor filter :-




Ac input




Dc output

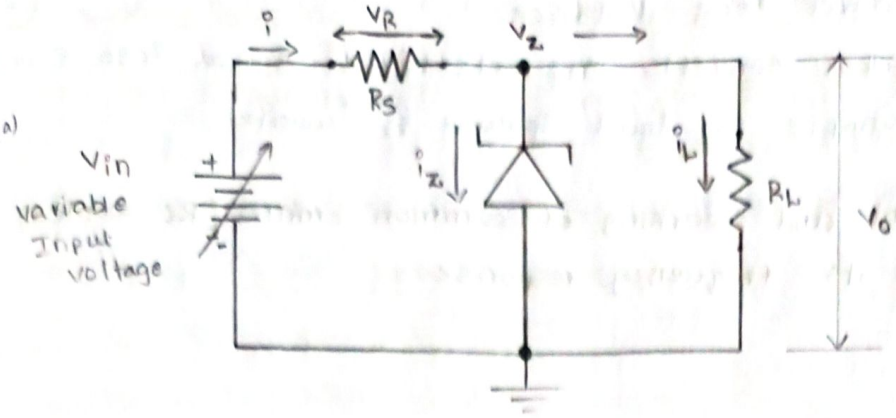
- The unwanted frequencies that are present at output of rectifier can be eliminated by using simple filter.
- The filter circuit consists of capacitor and the capacitive reactants is given by

$$X_c = \frac{1}{2\pi f c}$$

- For the Dc signal, frequency $f = 0$ and $X_c$ becomes infinity ($\infty$). i.e., the capacitor act as open circuit and will not allow Dc current it by pass the Dc current.
- For Ac signal, the capacitive reactants decreases and capacitor act as short circuit and will allow the Ac current through it.

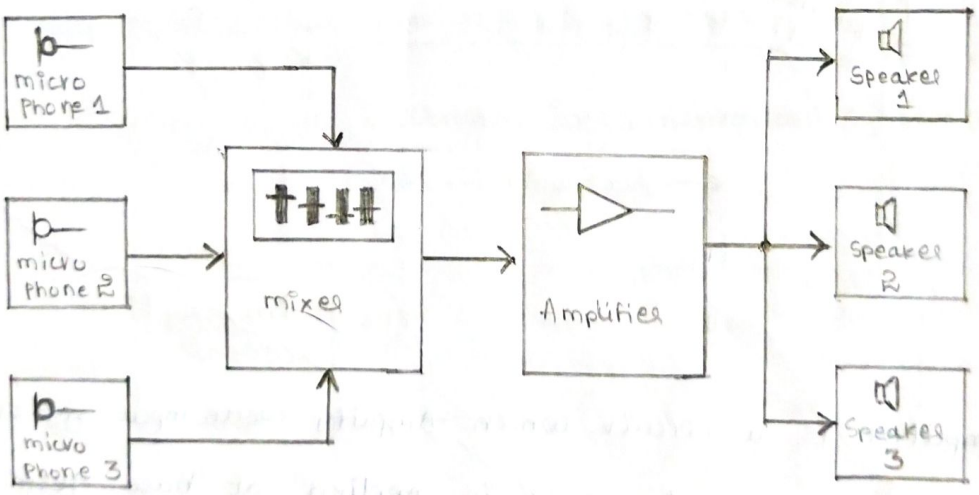
## Working of simple Zener voltage regulator :-

(4)




- Voltage Regulator is a circuit that provides constant DC output voltage even though there are fluctuations in the input voltage and variations in the load resistance.
- The Zener Diode under reverse bias act as voltage Regulator i.e., if you increase the reverse voltage and it reaches to Zener breakdown voltage then the Zener diode will provide constant voltage across it.
- Here, the diode will provide constant DC output voltage even though there is a change in input voltage and load Resistance value.

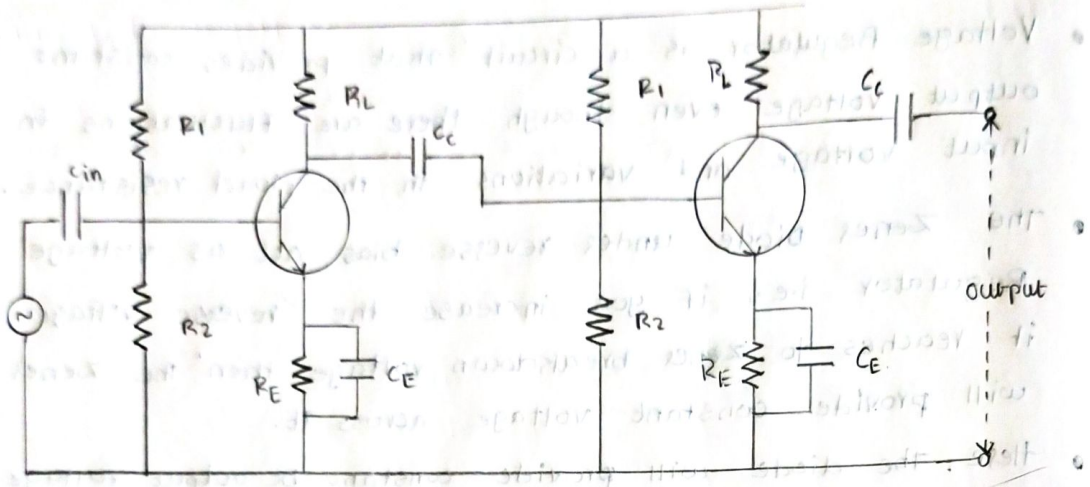
## Block diagram of Public Address system :-



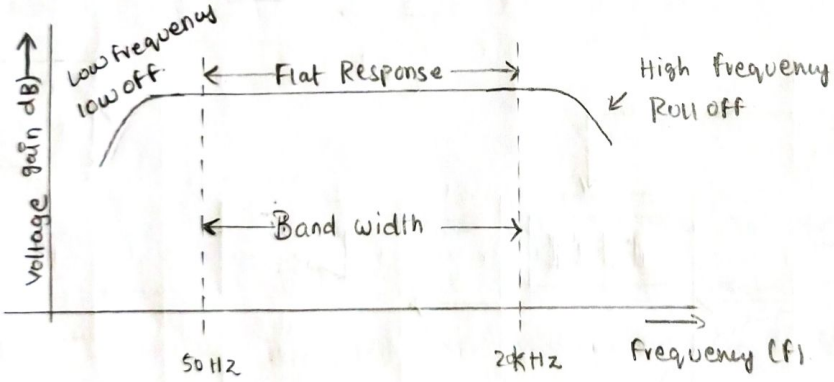

- As the Sound signal travel with distance the intensity of Sound signal decreases. In order to overcome this PA System was introduced.
- Here microphone act as transducer which convert input sound signal into electrical signal by using mixer we can combine different input signals.

- The Amplifier provides Amplification of signal. So that signal can travel long distance.
- The loud speaker converts the electrical signal into sound energy. The example for loud speaker is "woofer".

Circuit Diagram and working of common Emitter (RC coupled) amplifier with its frequency response.




Frequency Response of RC coupled Amplifier :-




- Amplifier is a circuit which Amplify weak input signal. Here, the AC input signal is applied at base terminal. output is available across load resistor $R_L$ which is connected at collector terminal.
- To provide proper DC biasing the voltage divider network $R_1$, $R_2$ and $+V_{cc}$ is used so the Transistor is operated in active region.
- The output of first stage CE Amplifier is given as input to the second stage through the Resistor and

capacitor $C_c$. Hence it is called as Rc coupled Amplifier.

Frequency Responce :-

At low frequencies (i.e., below 50 Hz) :-

- The capacitive Reactants $X_c = \frac{1}{2\pi fc}$ in this $X_c$ and frequency (f) are both in inversly propotional.
- At low frequency, as the frequency is low, the capacitive reactants is high. so only small part of the input signal appear at base terminal. that's why voltage gain decreases

At high frequencies (i.e., above 20 KHz) :-

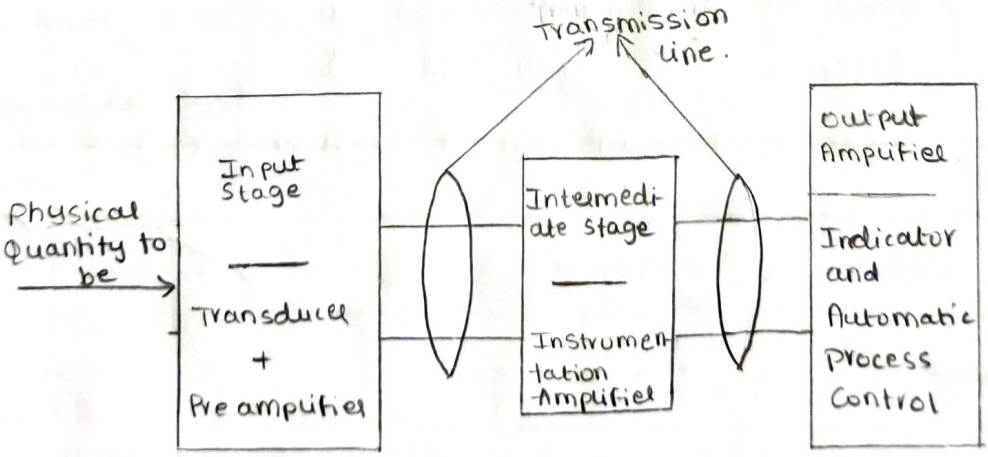
- At high frequencies, as the frequency is high, the capacitive reactance is low. so the capacitor act as short circuit and loading effect of next stage increases. Hence gain decreases.

At mid-Frequencies (i.e., 50 Hz to 20 KHz) :-

- If you increase frequency with in the medium frequency range the capacitive reactance decreases and Hence voltage gain increases. However the loading effect of next stage increases which causes decrease in voltage gain. Due to these two factors the gain remain constant.

Block diagram of an Electronic Instrumentation System :-

3(b)




- The Instrumentation system is an electronic system, which is used in Industries in order to measure the physical quantities such as temperature, pressure, velocity, etc....

- The purpose of transducer is which convert physical quantity into electrical signal.
- Pre Amplifier provides the Amplification of signal.
- The Instrumentation Amplifier, Amplify the signal in order to drive output stage.
- The Indicator provides the display of measured value.
- By using transmission line all these devices can be connected together.