

* Voltage Multiplier :-

- The voltage Multiplier is a special type of diode rectifier circuit which can potentially produce an output voltage many times greater than of the applied input voltage.
- Step-up transformers required for high voltage applications may not always be available. one alternative approach is to use a diode voltage multiplier circuit which increases or "step-up" the voltage without the use of transformer.

* Applications :-

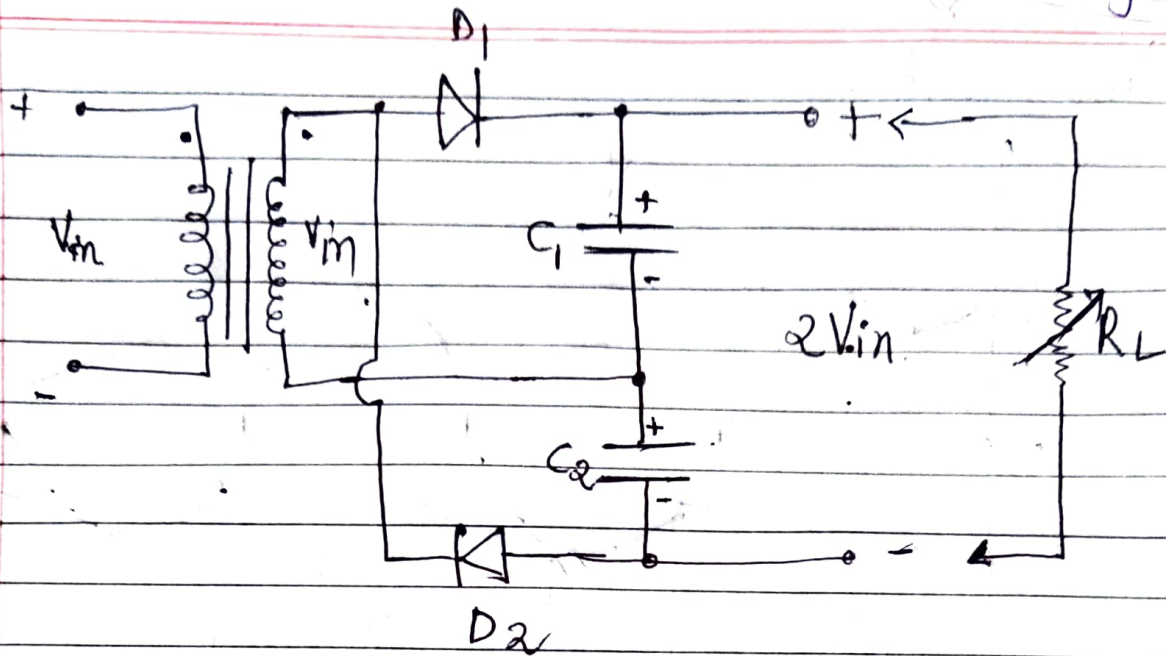
1. Microwave ovens.
2. Storage electric field coils for cathode-ray tubes.
3. High voltage test equipment.

* Full wave Voltage Multiplier :- (Full wave Voltage Doubler)

- Voltage Multiplier can cascade of "N" Doubler's, would produce an output voltage of $2N \cdot V_p$ (volts).

Voltage Doublers

→ Full wave voltage doubler
→ Half wave voltage doubler



→ When the sinusoidal input voltage is positive capacitor C_1 charges up through diode D_1 & when the sinusoidal voltage is negative, capacitor C_2 charges up through diode D_2 .

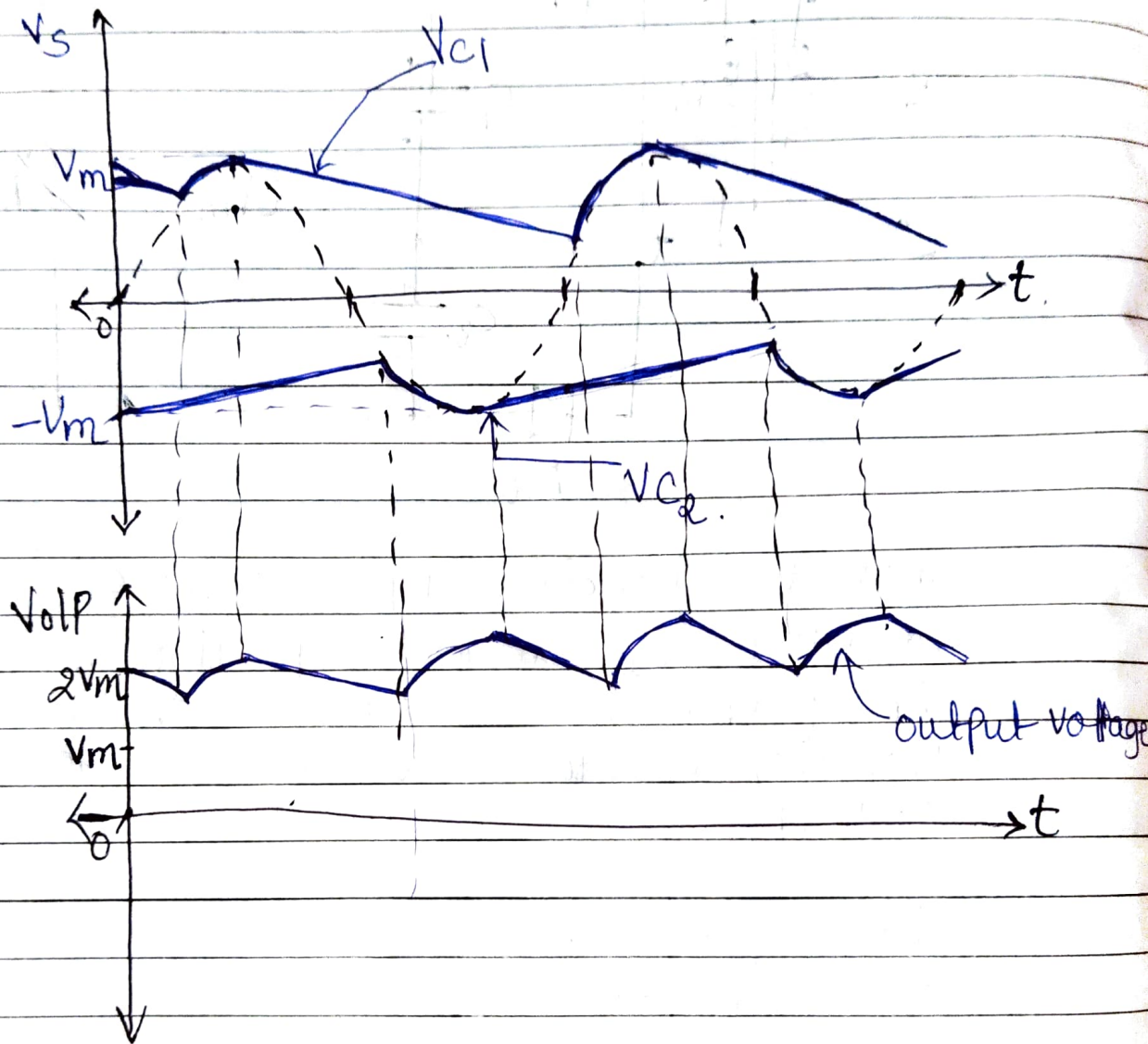
→ The output voltage $2V_m$ is taken across the two series connected capacitors.

→ The output voltage V_o is the sum of capacitor voltages V_{C1} & V_{C2} .

* Waveforms for full wave voltage doubler :-

→ The capacitors ' C_1 ' & ' C_2 ' will charge in positive & negative half cycles respectively of the ac secondary voltage to the peak value

V_m Volts.



$$\Rightarrow C = \frac{C_1 \times C_2}{C_1 + C_2}, \text{ Hence, this value is}$$

lower than C_1 as well as C_2 . This is the reason why filter action is poorer than a single capacitor filter circuit.

$$\Rightarrow PIV = 2V_m \text{ (}\because \text{ two Diodes is there).}$$

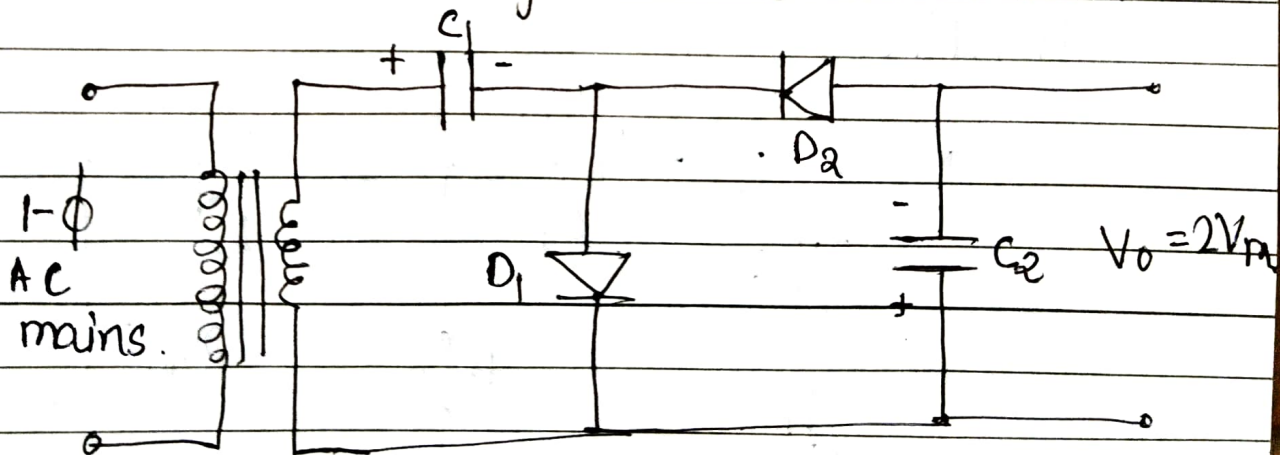
Advantage :-

Voltage multipliers can produce very high voltages without using the step-up transformer.

Limitations of Voltage multiplier :-

1. The voltage regulation is poor.
2. Ripple content in the output increase in load current. This is due to the poor filtering.
3. They are capable of supplying small load currents only.

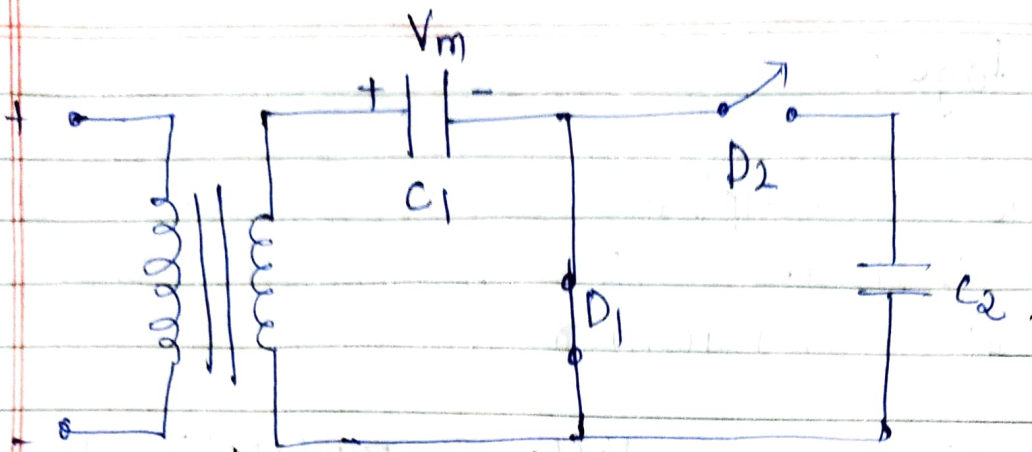
⊛ Half wave Voltage Doubler circuit :-



a) Half wave voltage Doubler.

Operations :-

1. Positive half cycle :-



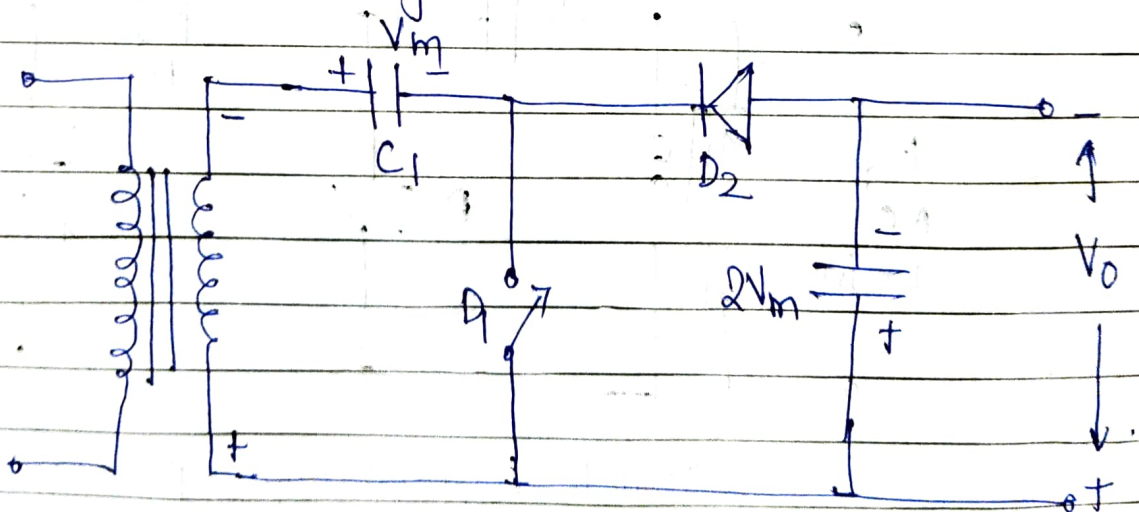
→ $D_1 = \text{ON}$.

→ C_1 = Charge through the Peak Secondary Voltage V_m .

→ $D_2 = \text{OFF}$.

→ C_2 isolates from C_1 .

2. Negative half cycle :-

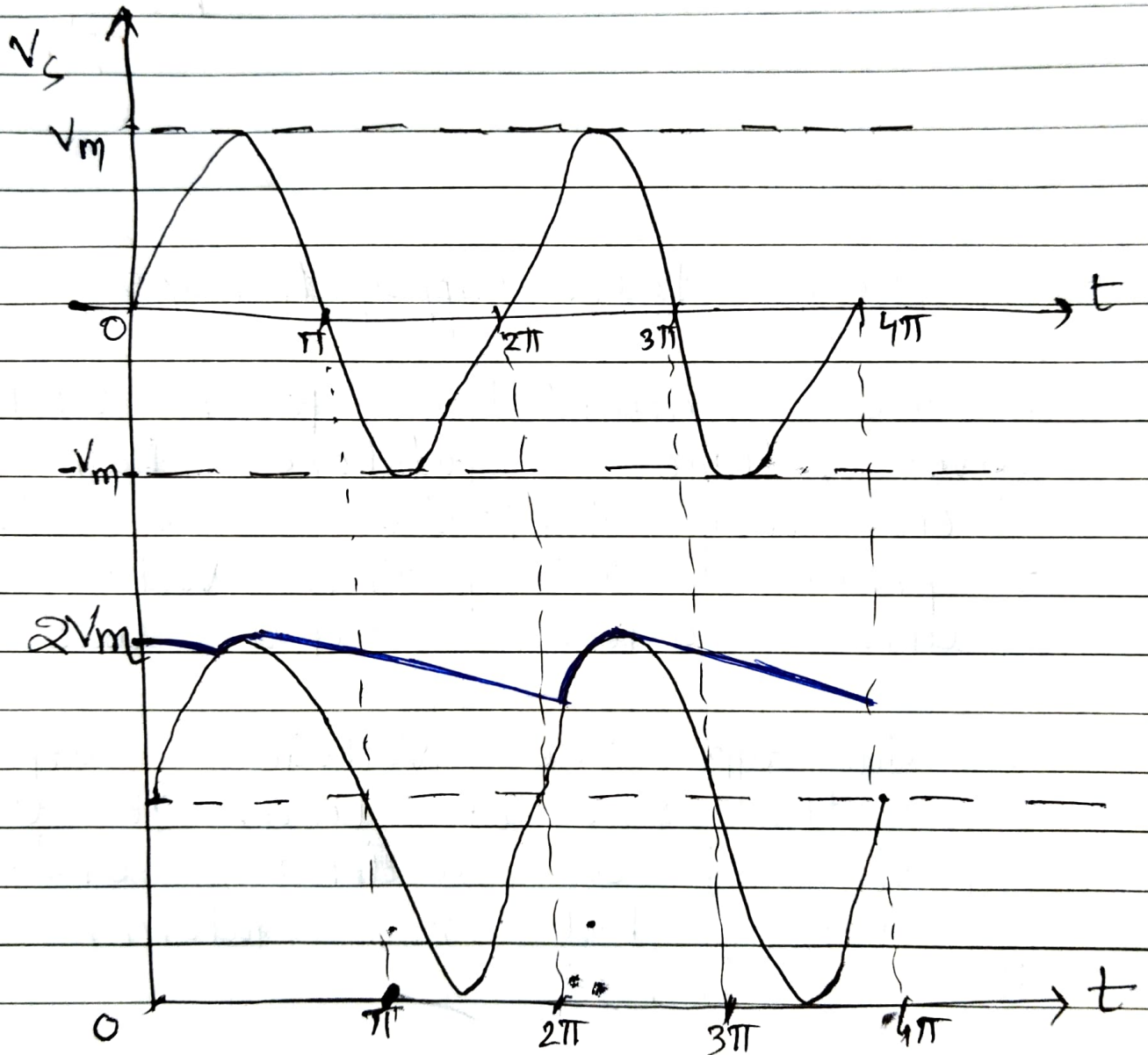


→ $D_1 = \text{OFF}$

→ $D_2 = \text{ON}$.

→ C_2 = acquire a Voltage of $2V_m$.

→ IF no load connected across capacitor C_2
both capacitors will remain charged.
i.e. C_1 to V_m
 C_2 to $2V_m$.



Power Supply

unregulated power supply

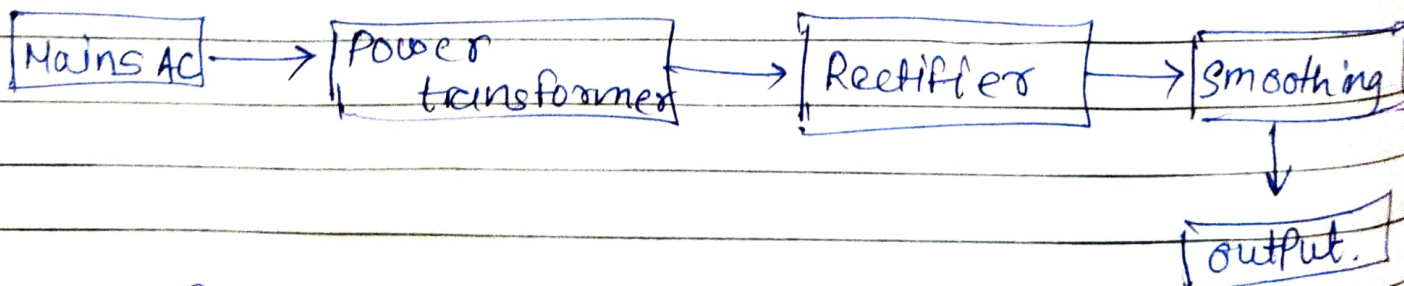
Regulated power supply

Linear, switched or battery based power supply.

1. Unregulated Power supply theory :-

Because unregulated power supplies don't have voltage regulators built into them, they typically are designed to produce a specific voltage at a specific maximum output load current.

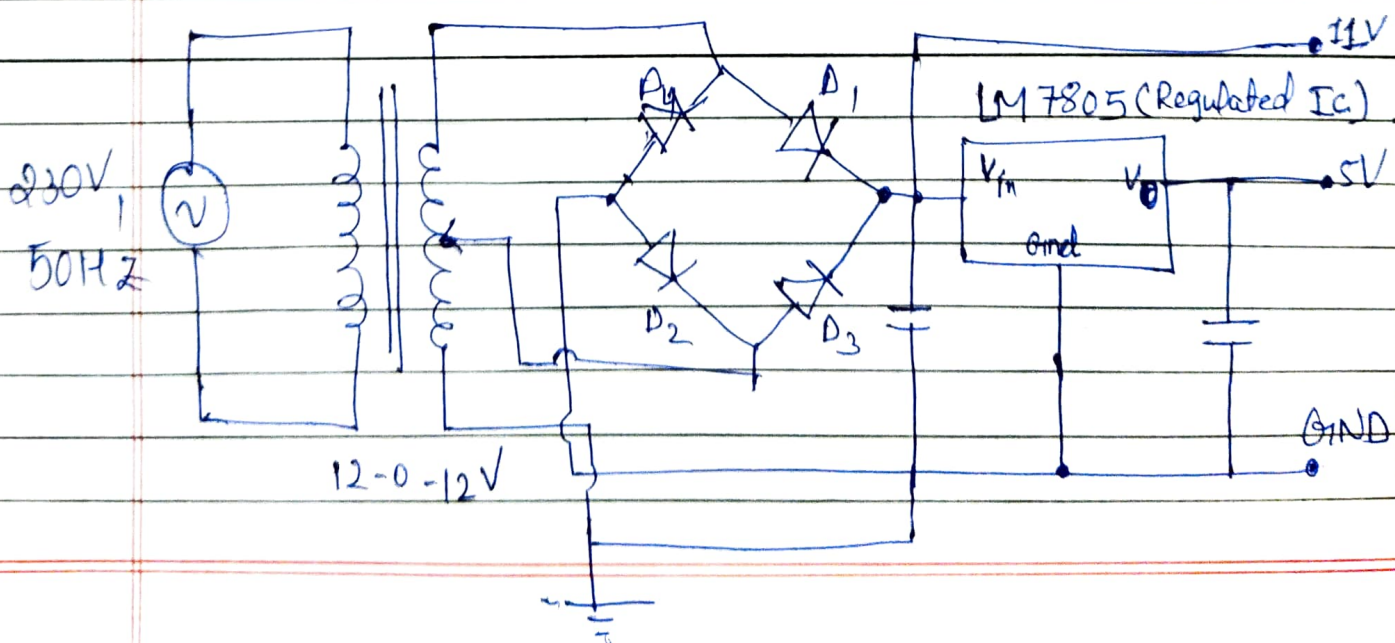
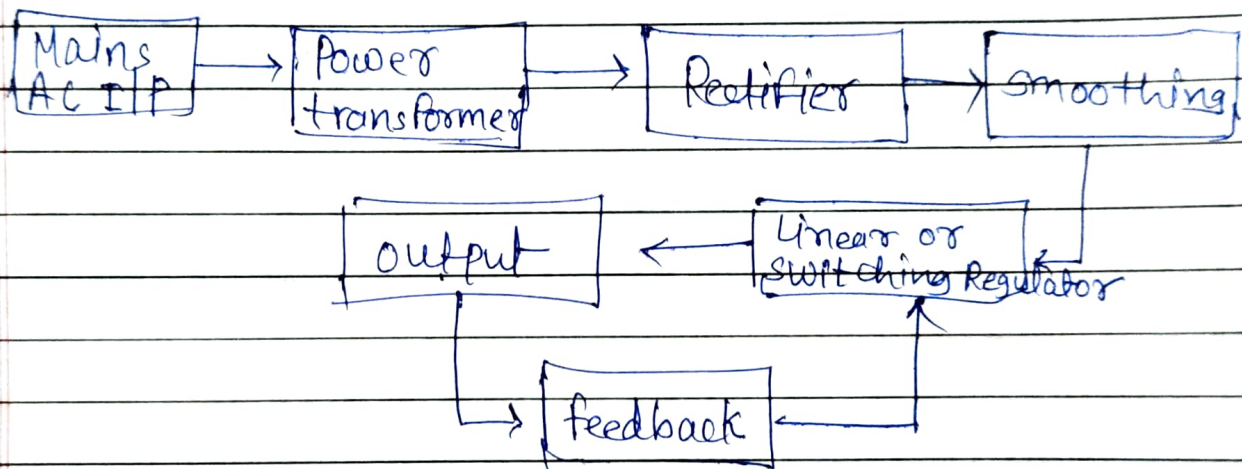
→ In this type, the voltage output varies with the size of load. It typically consists of a rectifier and capacitor smoothing but no regulation to steady the voltage.



① Block diagram of unregulated linear supply.

2. Regulated Power Supply theory :-

- A regulated DC Power supply is essentially an unregulated Power supply with the addition of Voltage regulator.
- This allows the Voltage to stay stable regardless of the amount of current consumed by the load, provided the predefined limits are not exceeded.



* Power Supply troubleshooting.

Troubleshooting the Power supply basically means isolating the supply as the cause of problems within a system & if necessary, replacing it.

The following is a list of PC Problems that often related to the Power supply.

1. Any power-on or system startup failures or lockups.
2. Spontaneous rebooting or Intermittent lockups during Normal operations.
3. Hard disk & fan Simultaneously failing to spin.
4. Electric shocks felt on the system case or connections.
5. Slight static discharges disrupt system operation.

* Common Power-supply related Problems:

1. Check AC Power Input. Make sure that cord is firmly Seated in the wall Socket & in the power supply socket. Try a different cord.

2. Check DC Power connections. Make sure motherboard & disk drive power connectors are firmly seated & making good contact. Check for loose screws.
3. Check installation peripherals.