Class notes : APE

DC-DC CONVERTER Lect:1

Application of DC-DC Converter:

- SMPS, DC Drives, subway, cars, trolley busses, battery operated vehicle, battery charging etc.
- NASA was the first to design light weight and compact SMPS for space vehicle
- 70 to 80% power supply design is SMPS

To get DC Following options are possible

1) Phase controlled Rectifier (half wave, full wave controlled rectifier etc)
2) Linear regulated power supply (Lab dc power supply, 7805, 7812 etc)
3) SMPS (Buck, boost, flyback, forward etc)

Disadvantages of Phase controlled rectifier:

- phase controlled rectifier works on 50 or 60Hz
- to remove ripple (of 50 or 60Hz) filter size are very large
- Size of L and C makes system bulky and increase weight of the syatem
- efficiency reduces

Q. Compare switching voltage regulator with linear voltage regulator.

Q. What do mean by switch mode power supply? How is it differs from linear regulated power supply?

Q. **Disadvantages of Linear regulated Power supply:**

- In linear regulated power supply switches are operated in active region.
- In linear regulated supply, the difference between output and input voltage will be dropped across the transistor.
- So, Power loss across the switch=(Volt drop across the device) $\times(I_{LOAD})$
- As volt across the switch is higher in case of linear regulated power supply losses will be higher and efficiency will be lower in comparison with SMPS.
- Temp will be higher and thus cooling requirement is higher (heat sink size) in linear regulated power supply.
- The source current waveform is peaky, predominant 3rd harmonic

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- Difficult to filter
- require transformer to operate at 50Hz.
- While in case of SMPS switches are operated either in saturation (on state) or cutoff (off state) region. so more efficient and with reduce size
- SMPS operates at higher frequency (100kHz)
- $Q \propto f\ B_m\ \delta\ K_W\ A_W\ A_i$; by increasing the frequency for the constant power size of transformer/magnetic will reduced

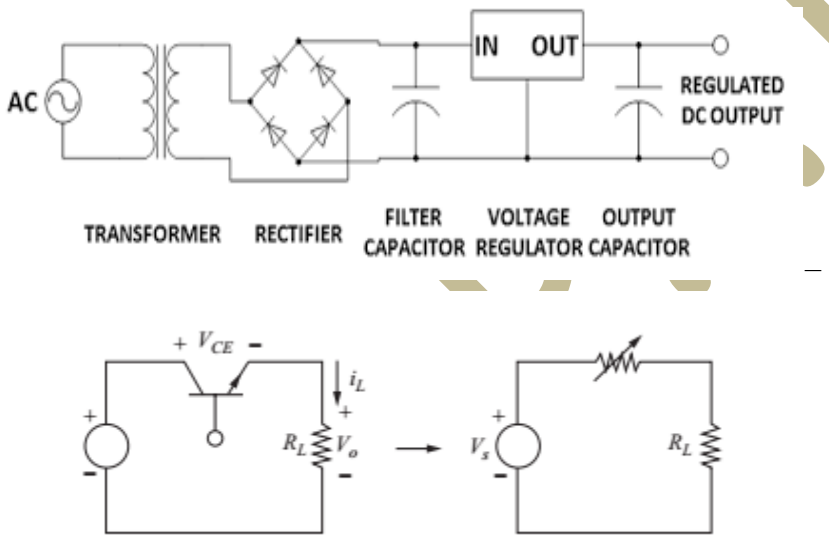

Fig. 1 Linear Regulated Power Supply(Upper), Inside of voltage regulator

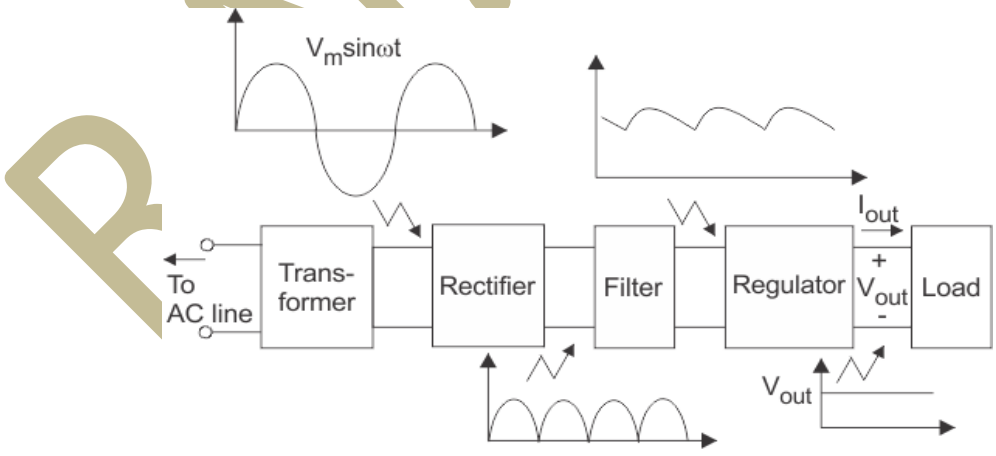

Fig. 2 Block Diagram of Linear regulated Power supply

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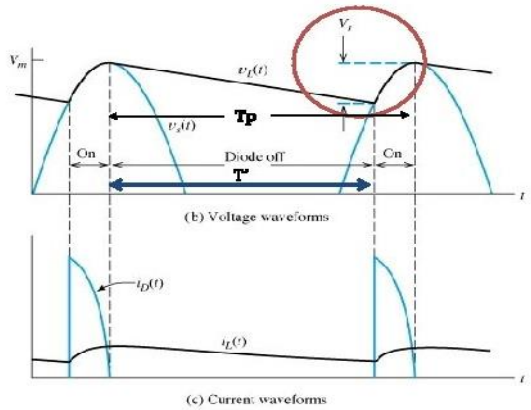

F-ig. 3 Peaky supply current

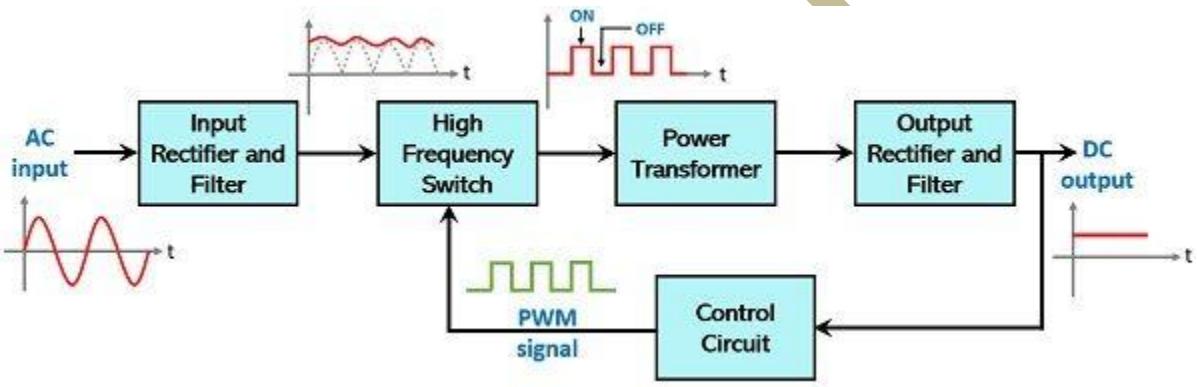

Fig. 4 Block Diagram of SMPS