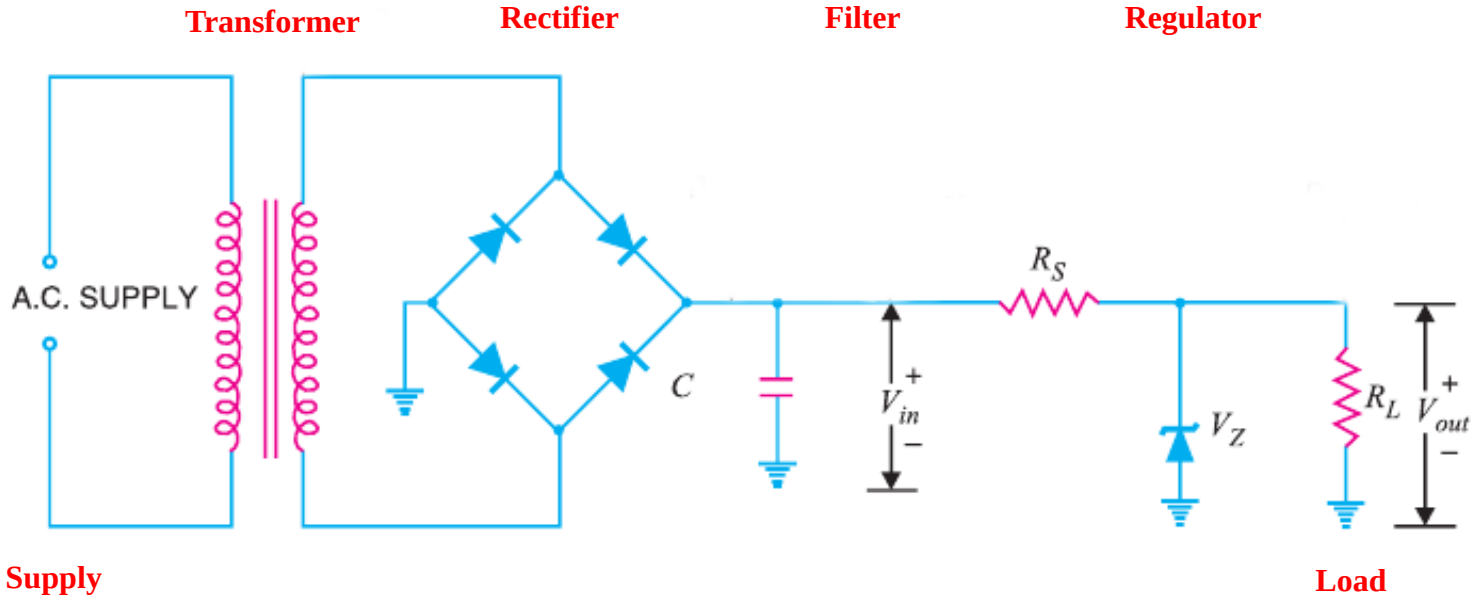
Basic Electronic Circuits (IEC-103)

Lecture-12

DC Power Supplies

Circuit Diagram of a Simple Regulated Power Supply



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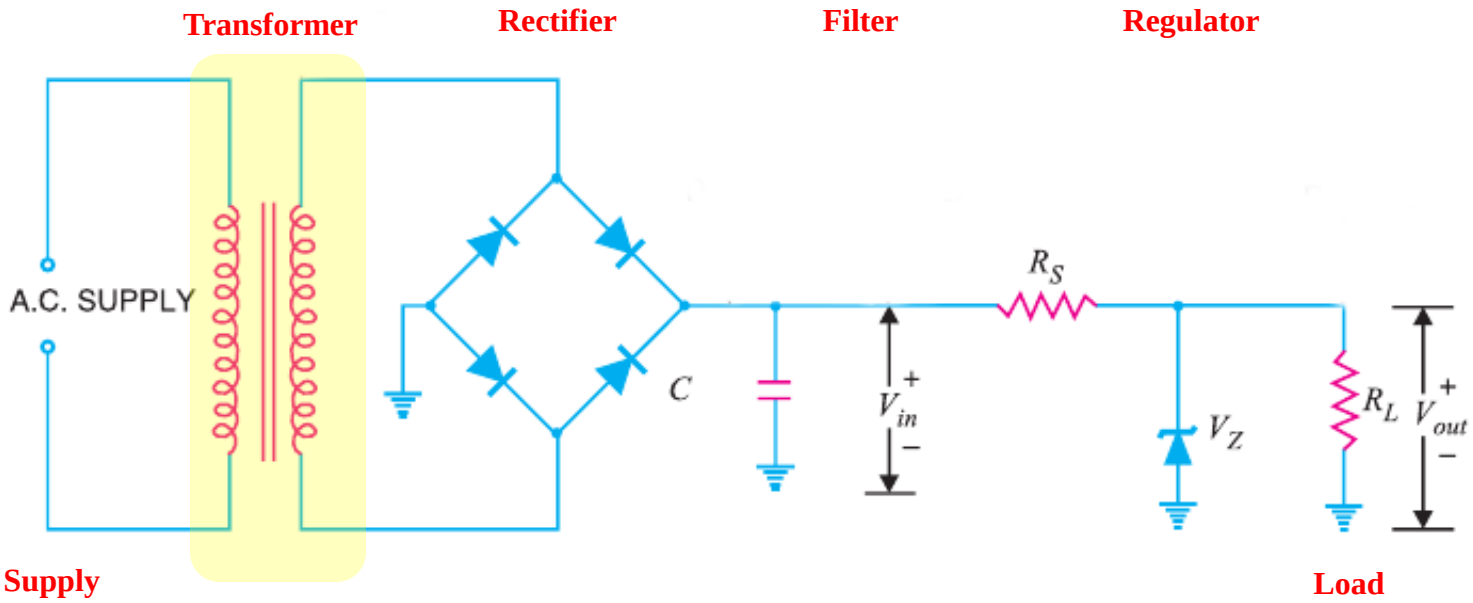

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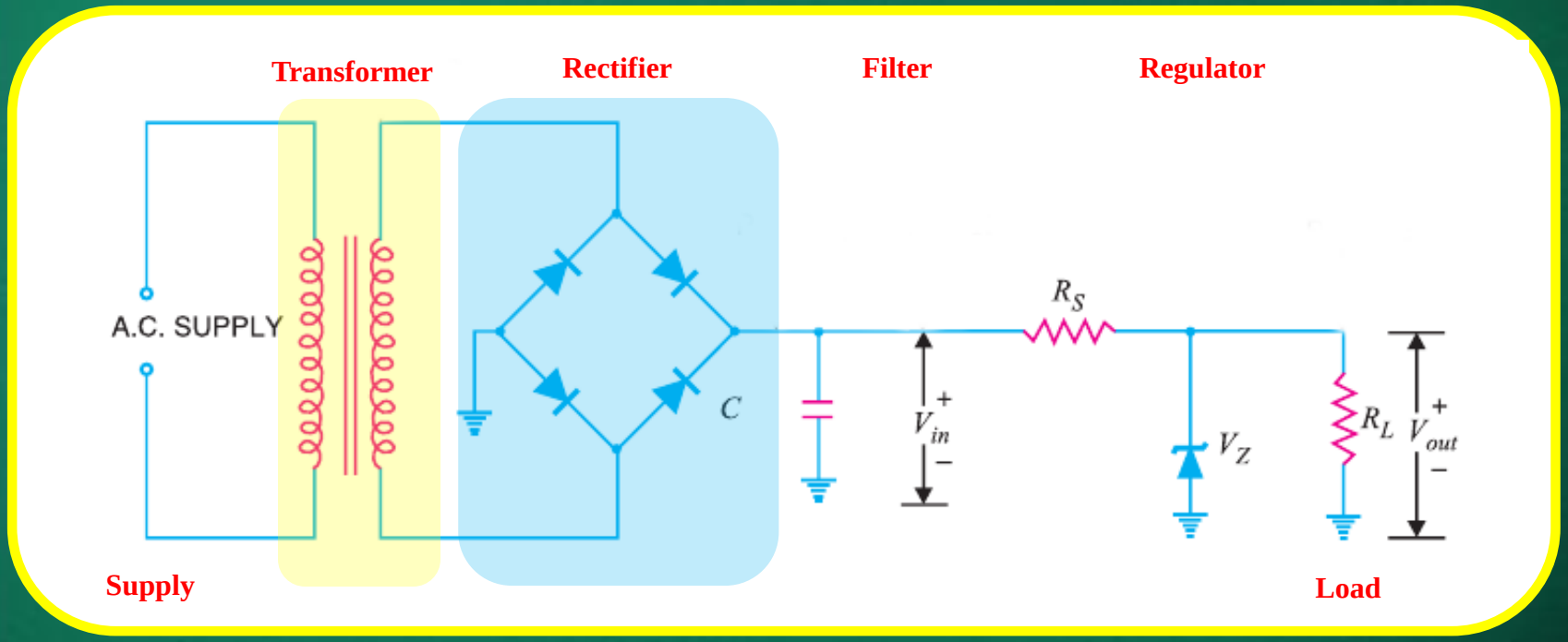

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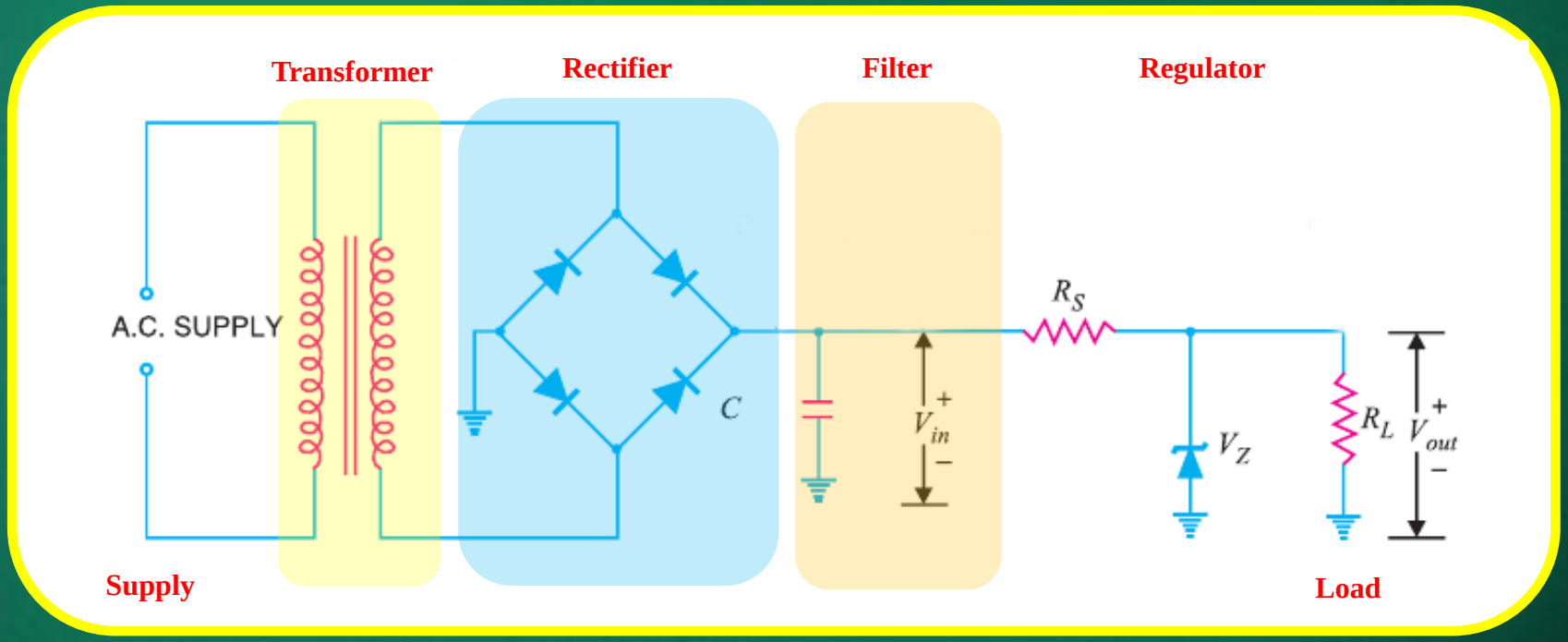

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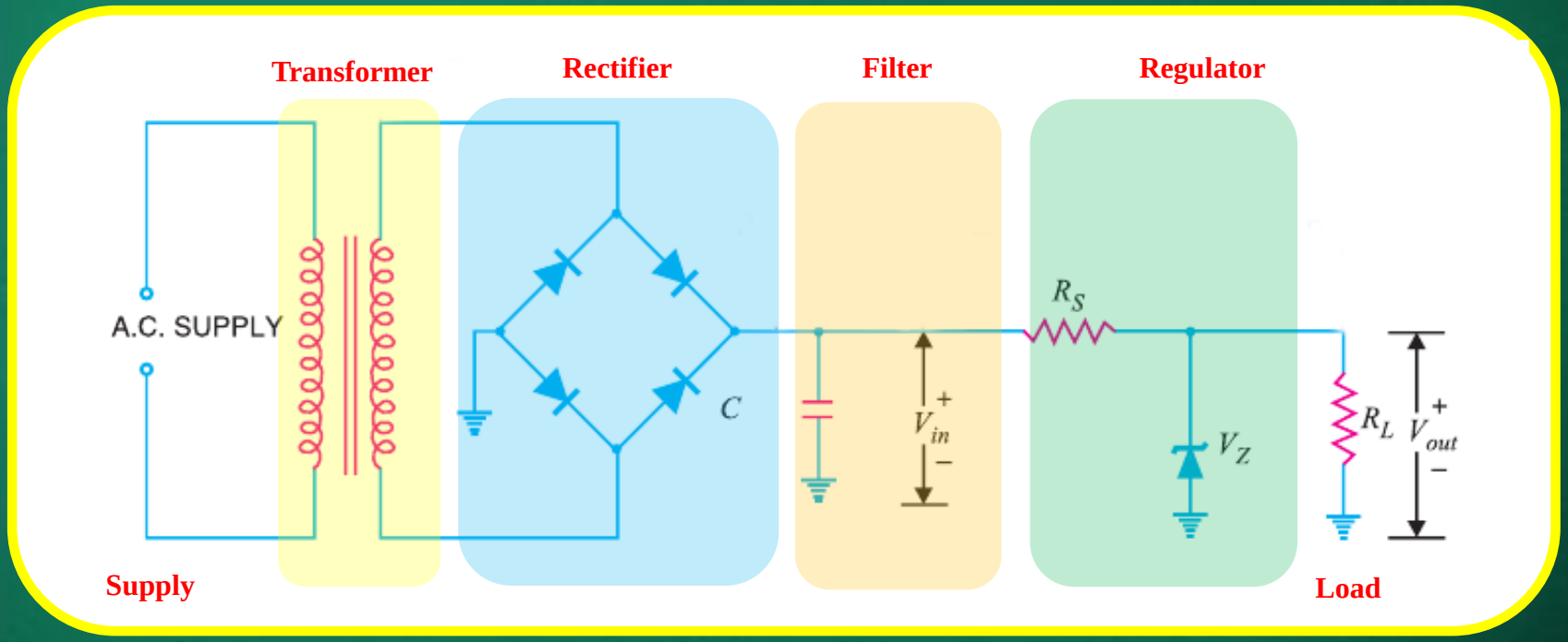
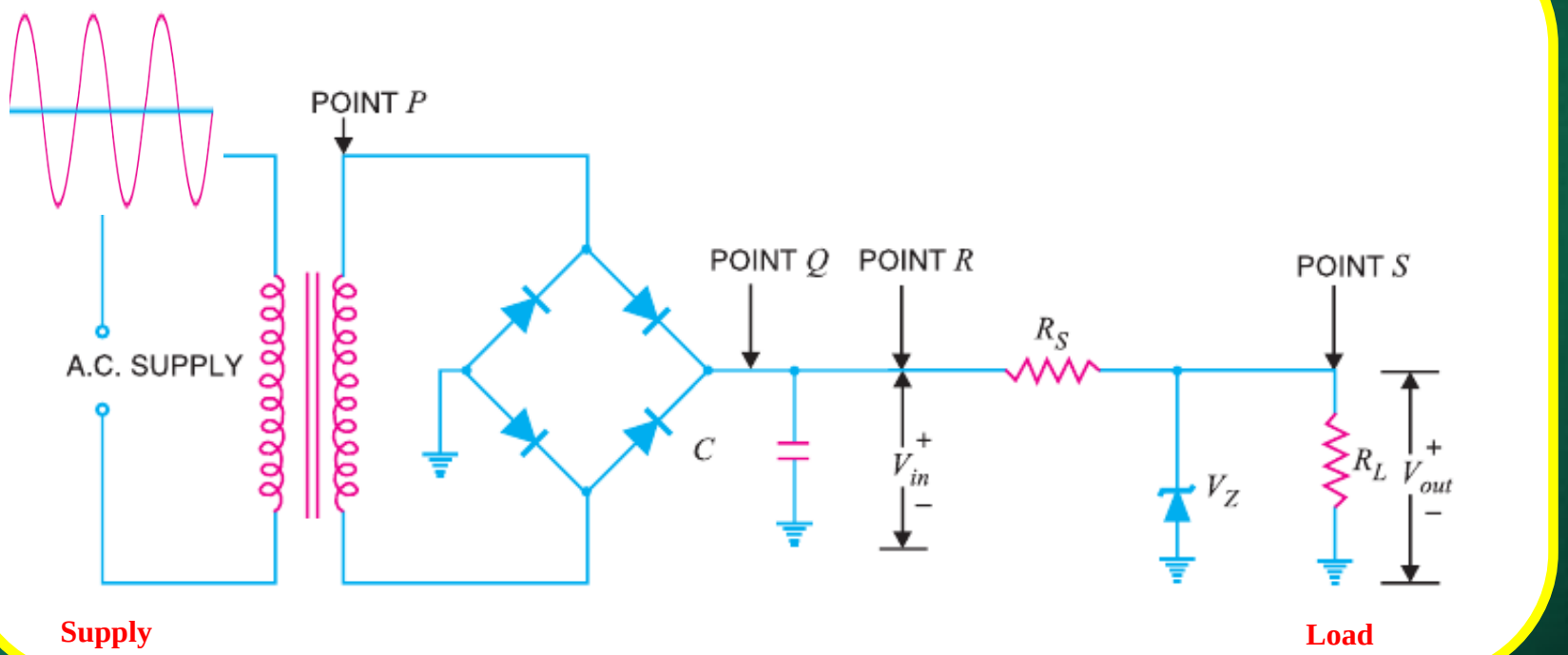


Output Waveform after each Stage



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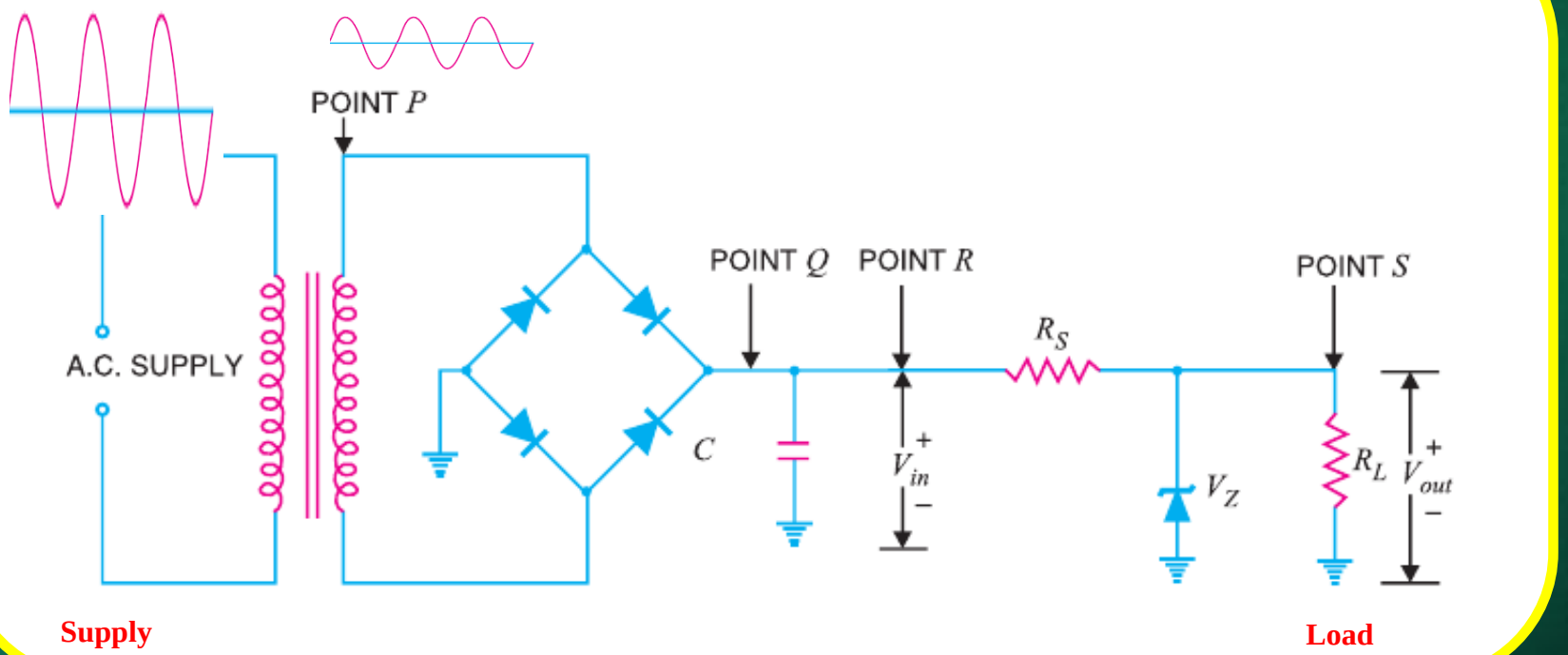

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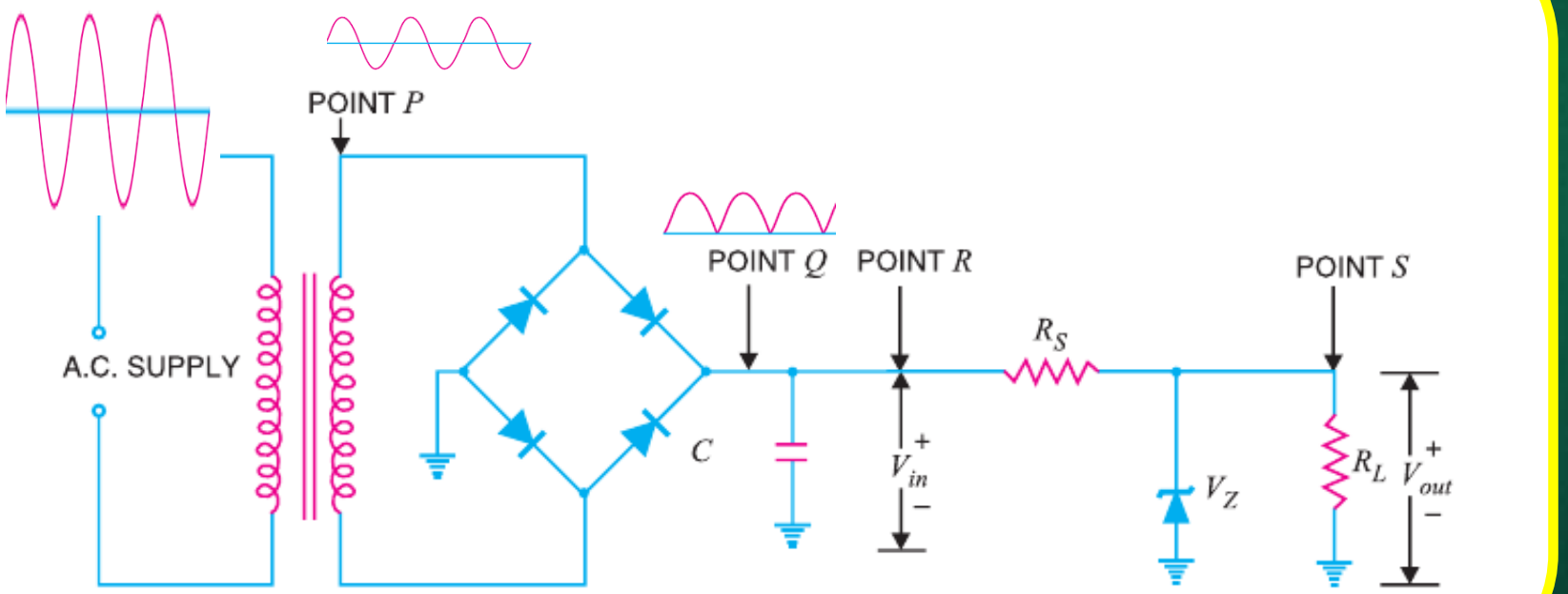

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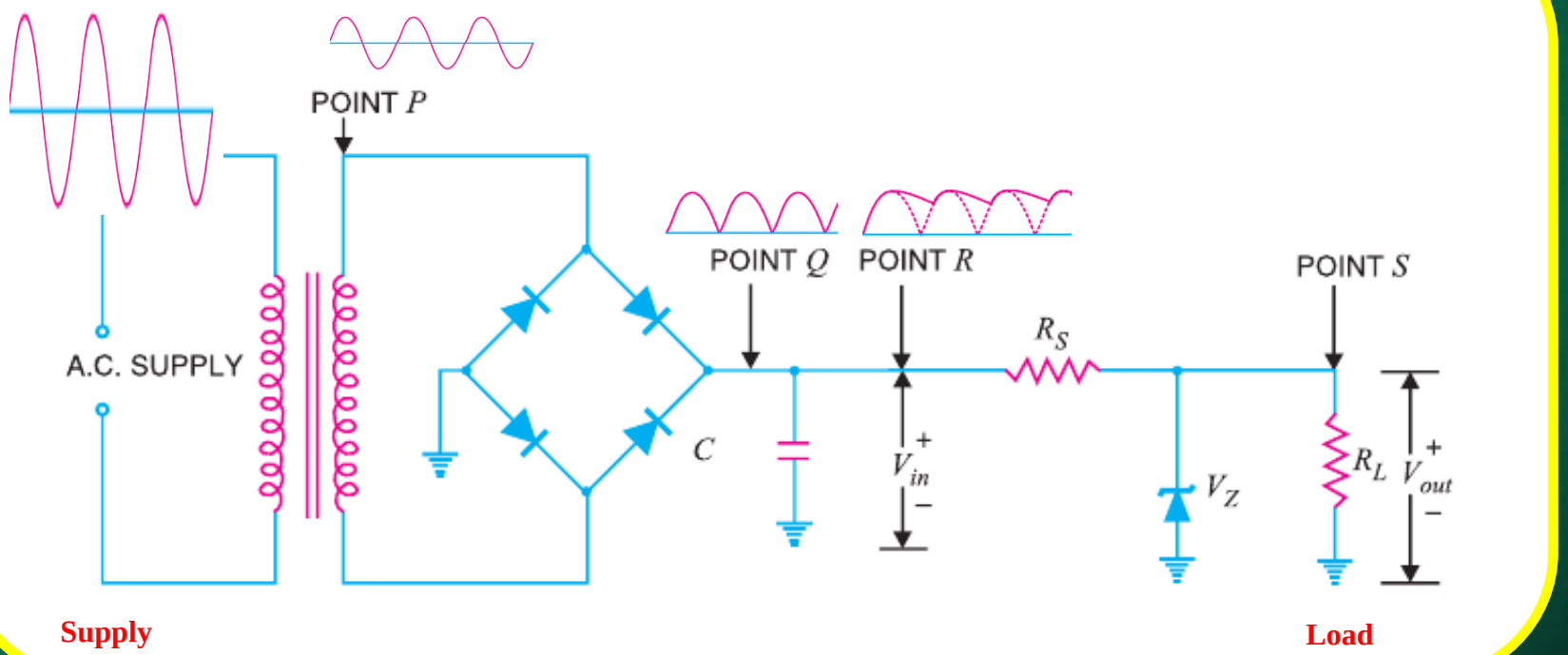

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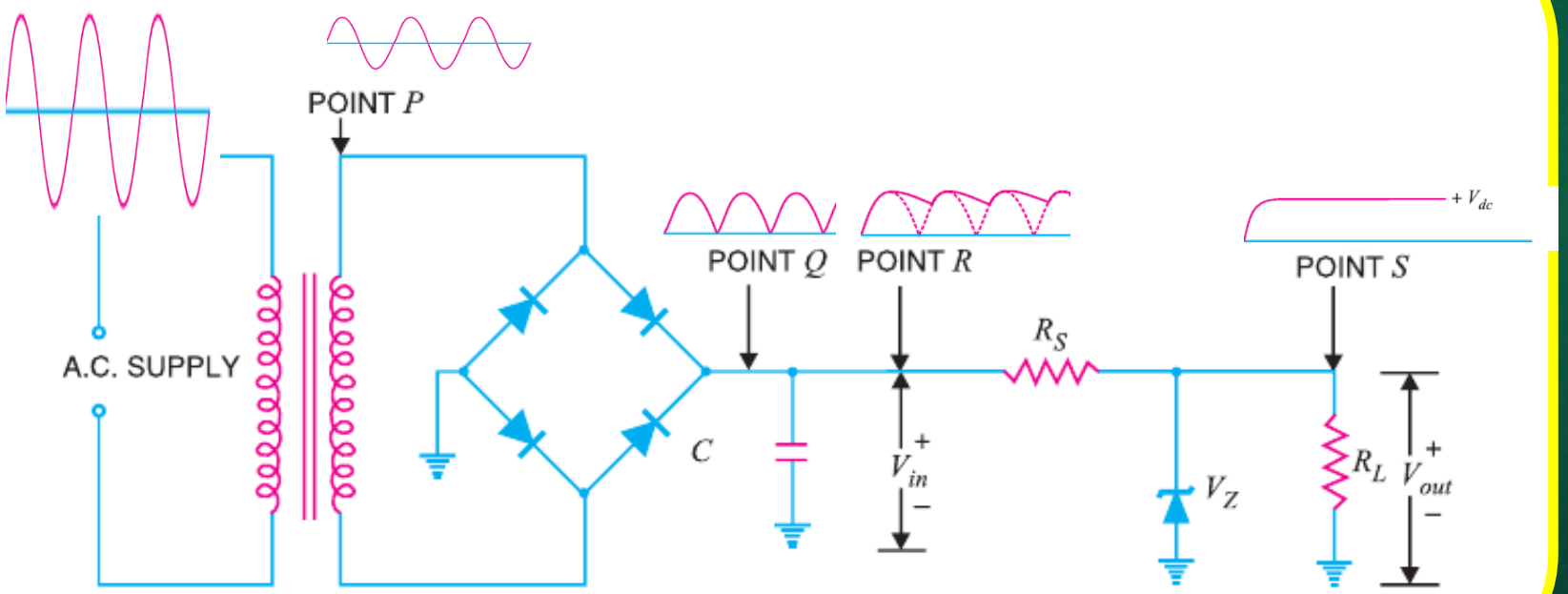

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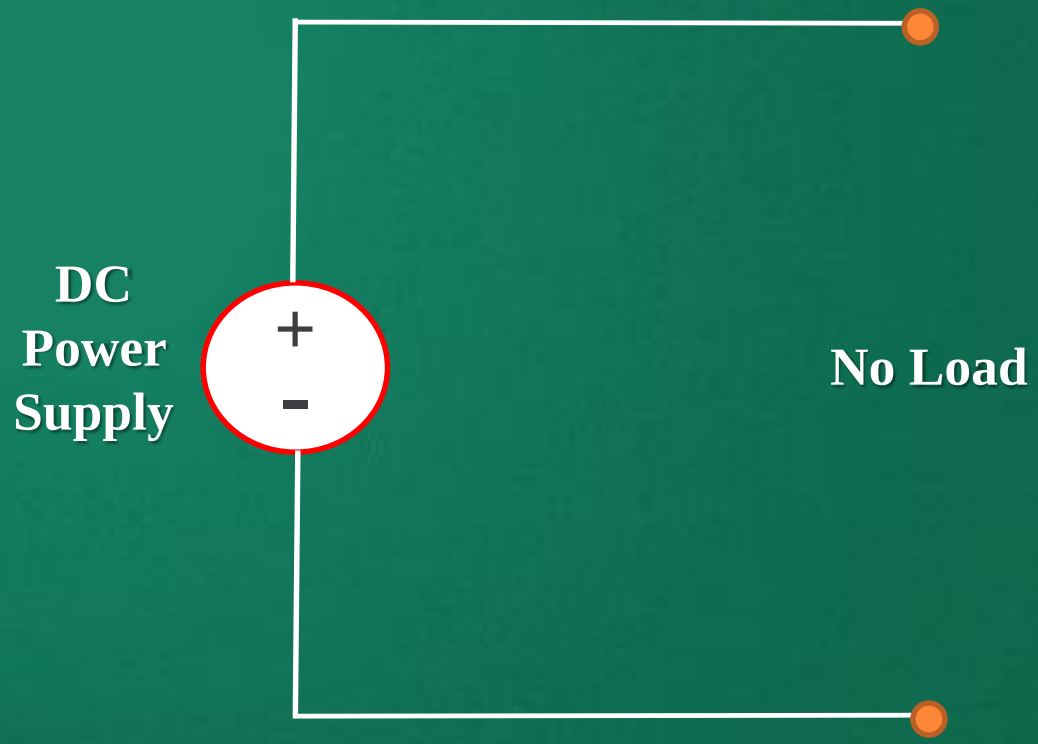
$$\%LR = \frac{V_{NL} - V_{FL}}{V_{FL}} \times 100$$

No Load & Full Load for a Voltage Source

No Load & Full Load



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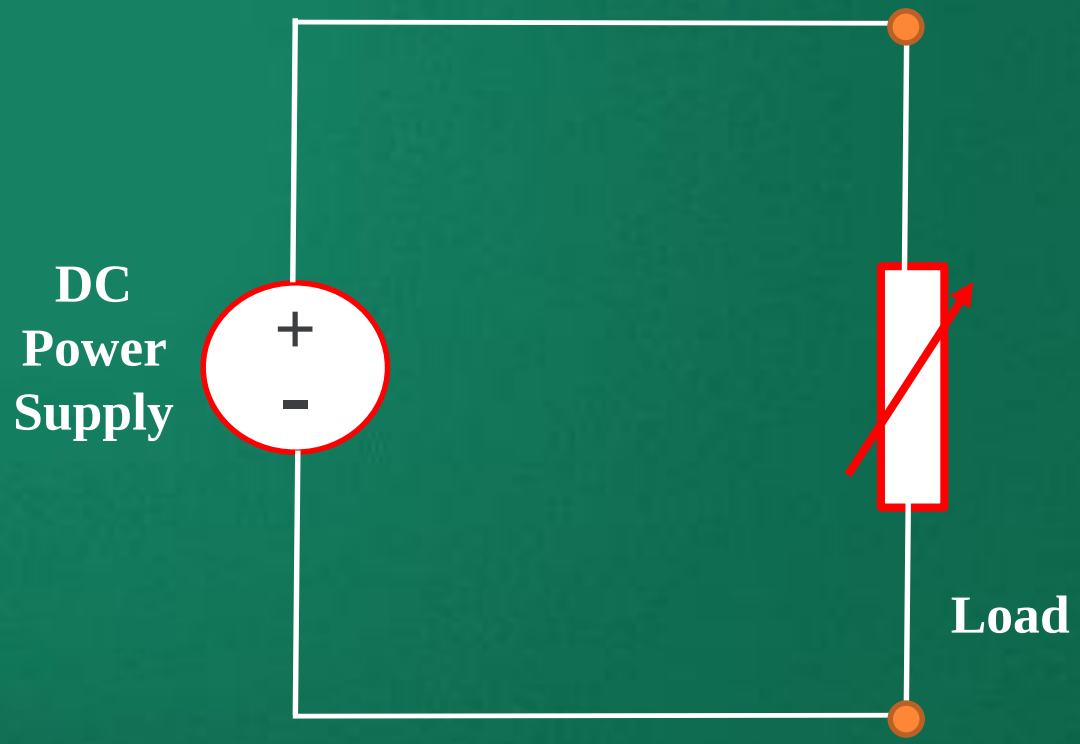

Transformers

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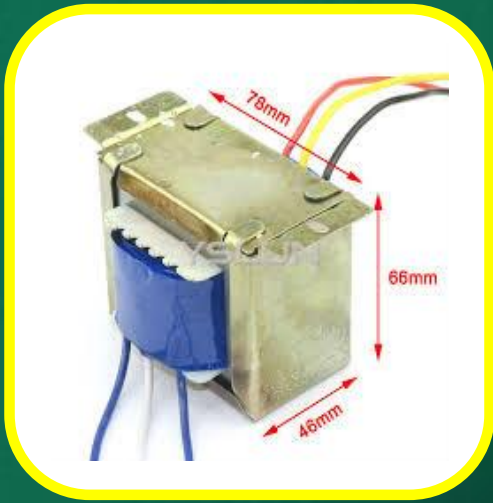

With Centre Tap

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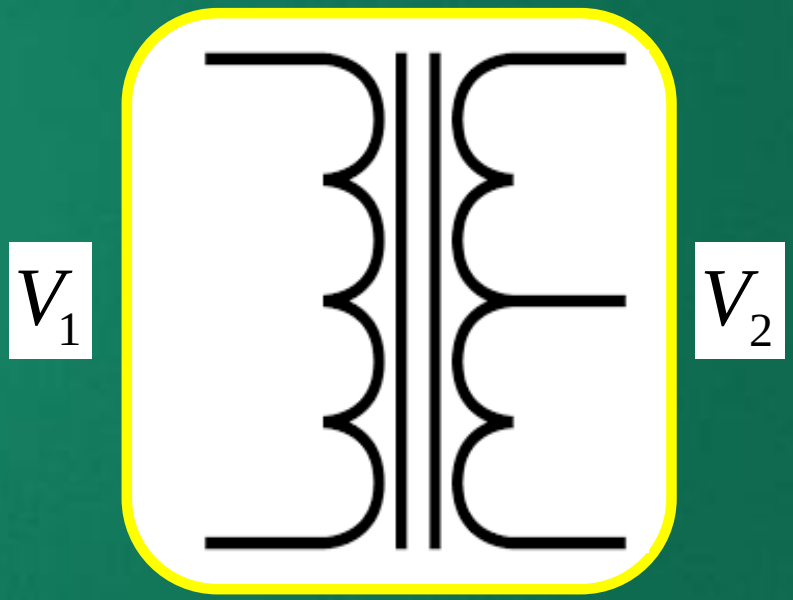

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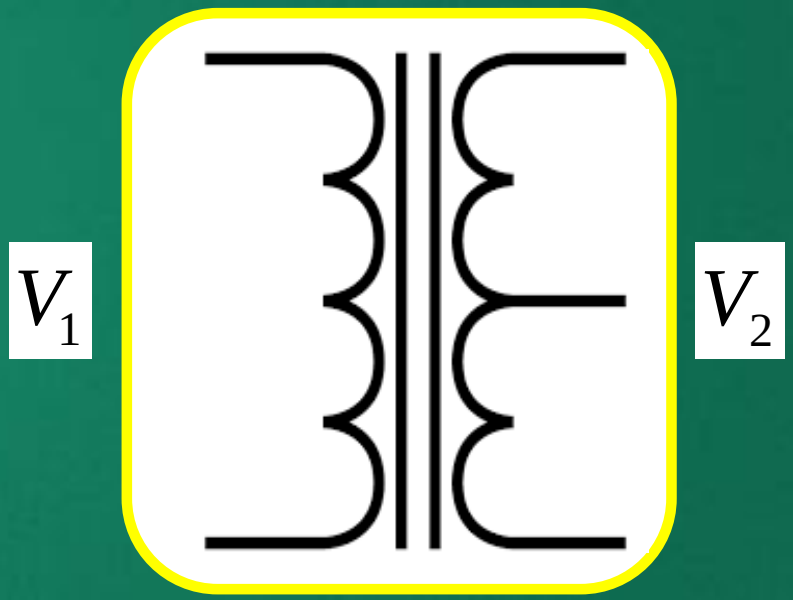

$$\frac{V_2}{V_1} = \frac{N_2}{N_1}$$

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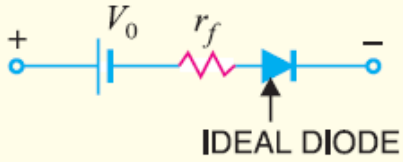
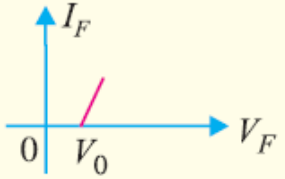
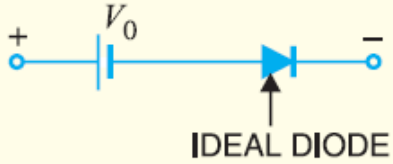
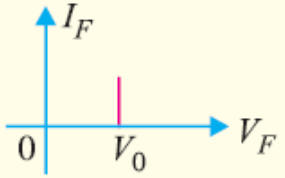
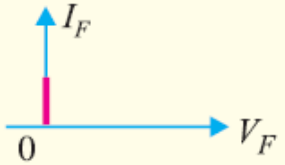
- Can be classified into two types
  - Half wave rectifiers
  - Full wave rectifiers

Diode Equivalent Circuits

S.No.	Type	Model	Characteristic
1.	Approximate model		
2.	Simplified model		
3.	Ideal Model		

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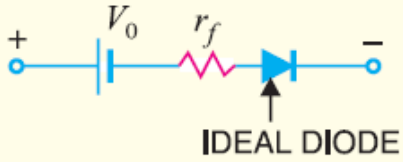
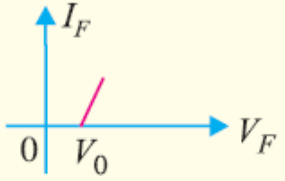
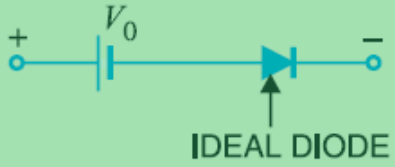
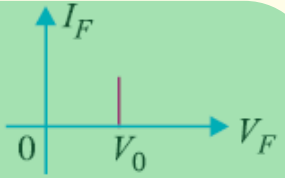
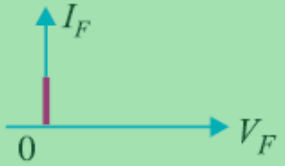
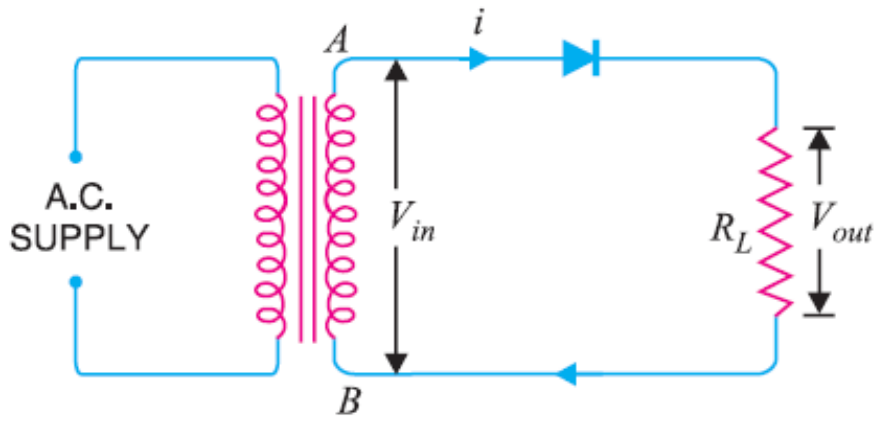
1.	Approximate model		
2.	Simplified model		
3.	Ideal Model		

Half Wave Rectifier



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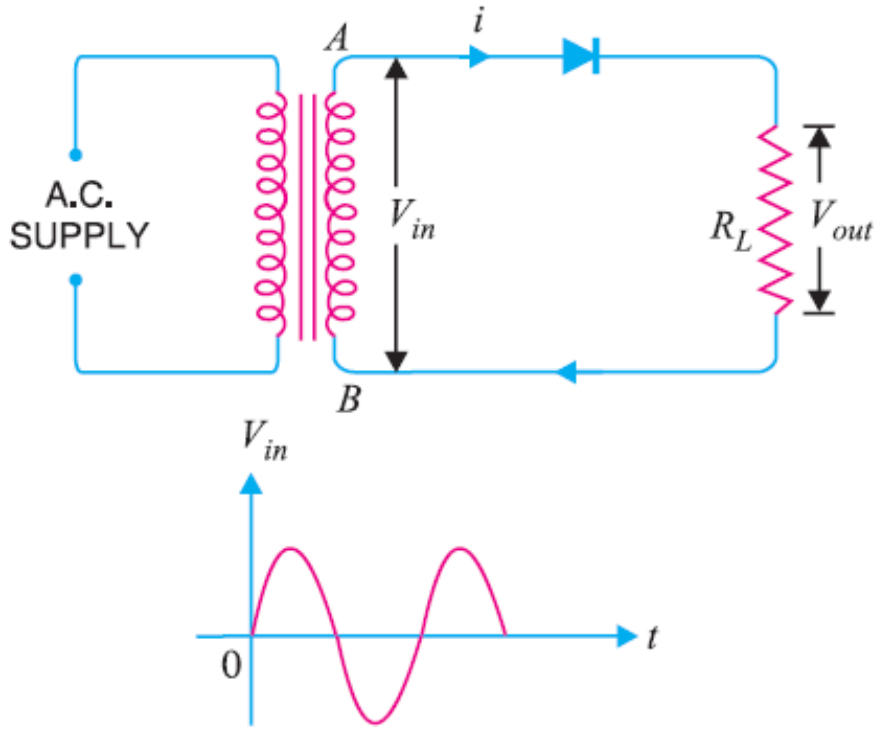

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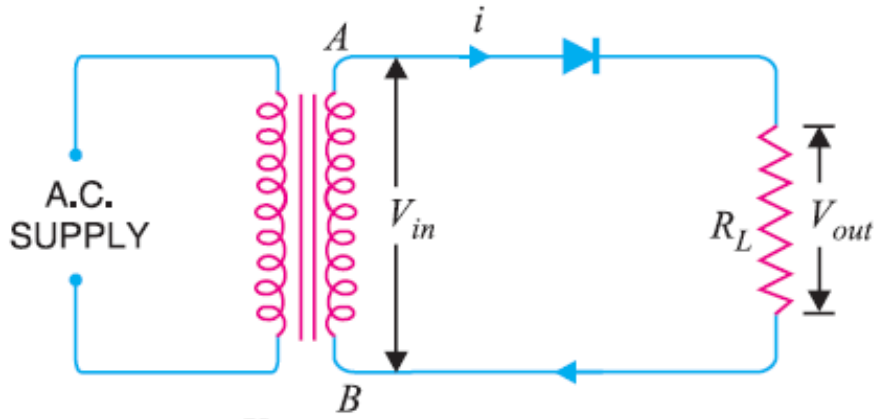

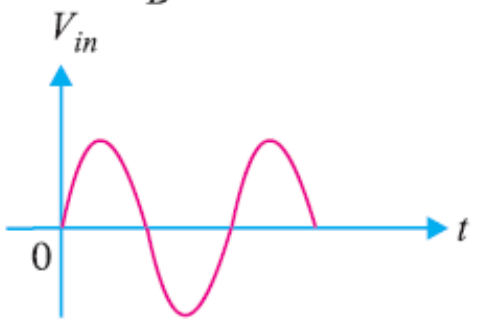

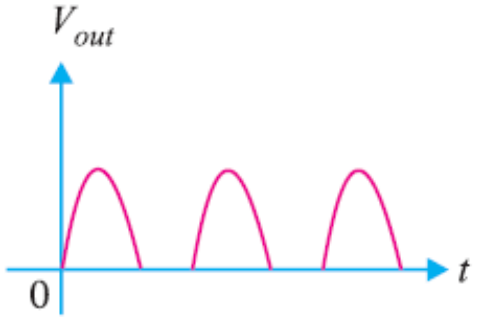

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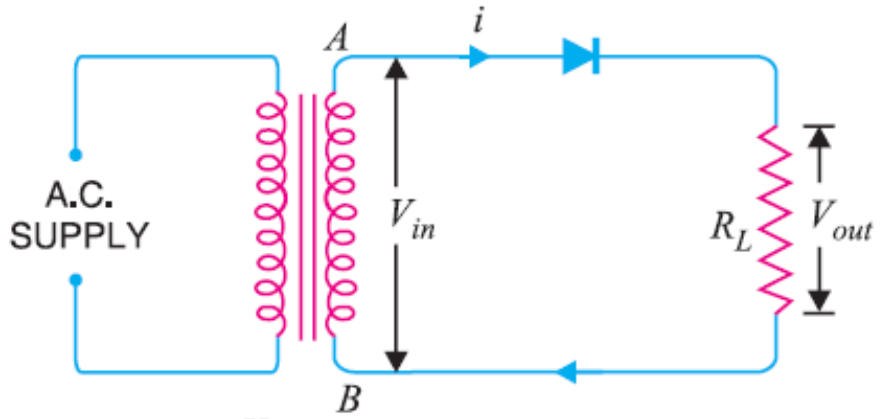

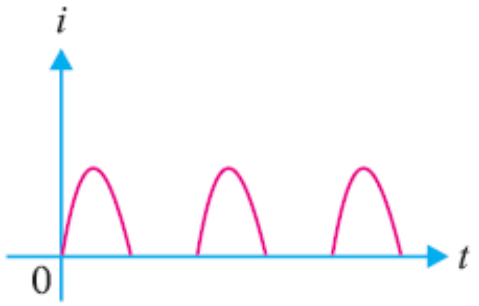

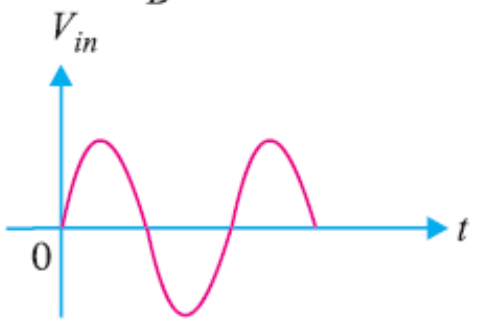

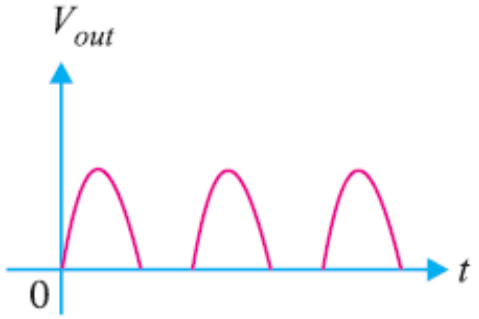

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- **It delivers power only half the time, therefore output is low.**

Full Wave Rectifiers

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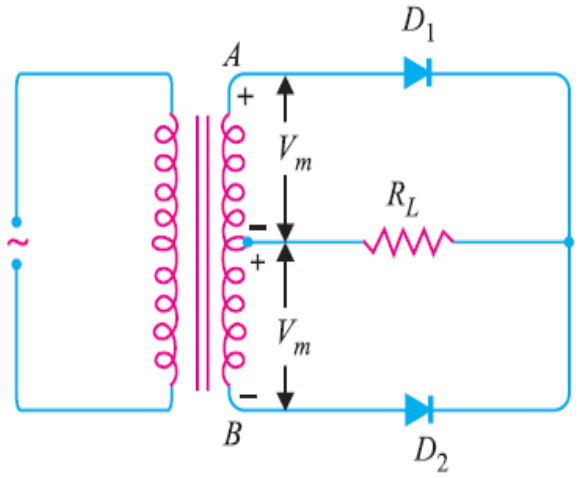
  - Centre-Tap Full Wave Rectifier



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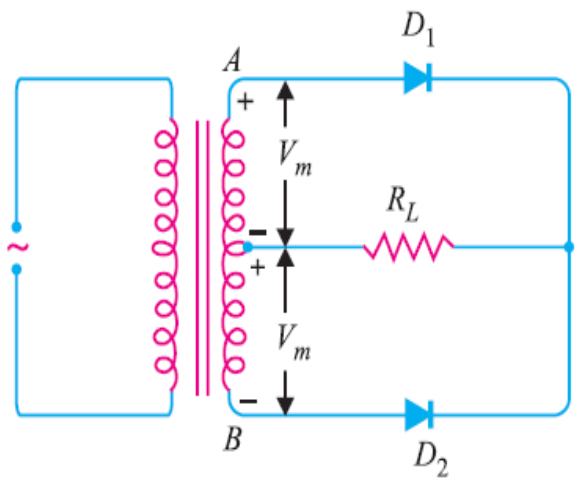
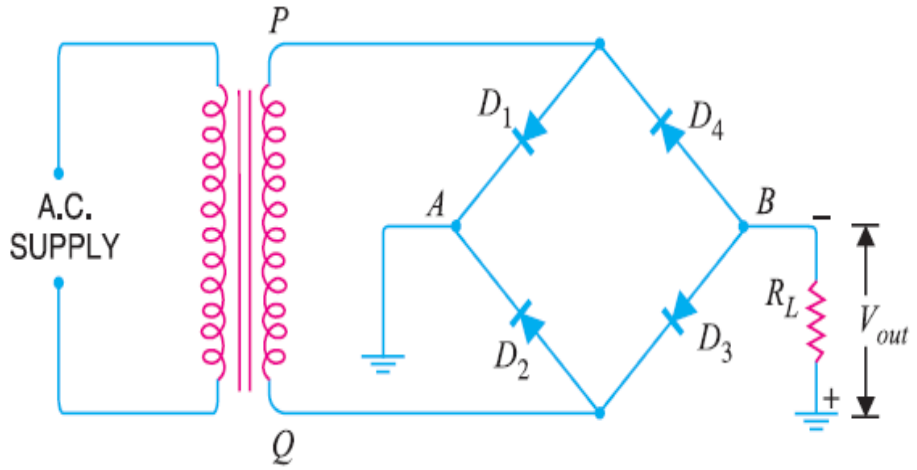
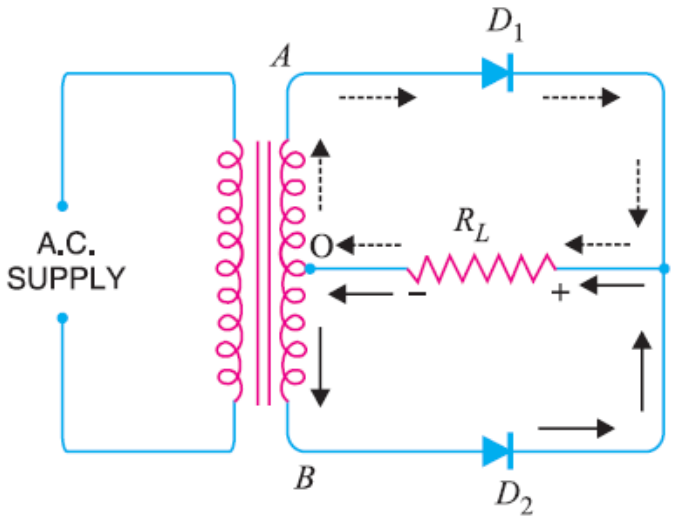




Centre-Tap Full Wave Rectifier



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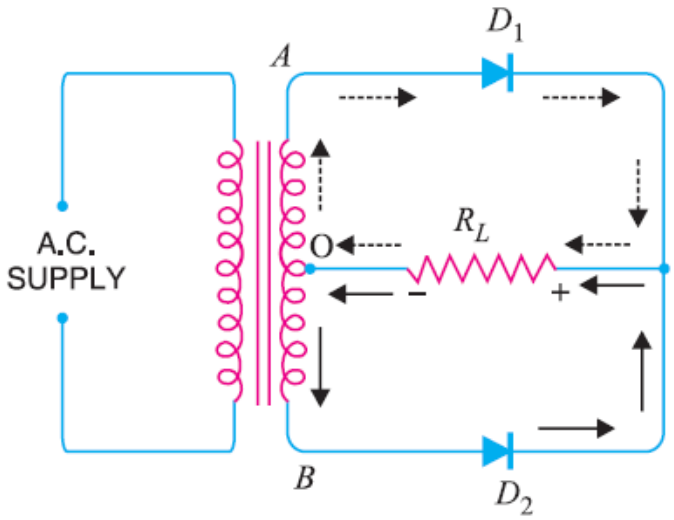

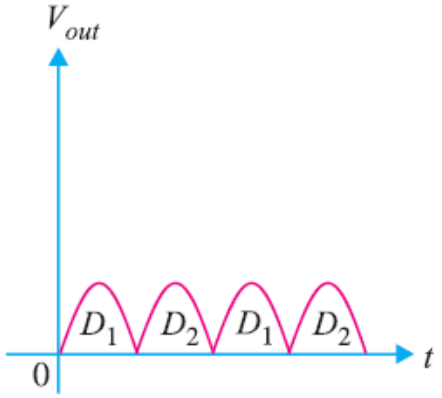

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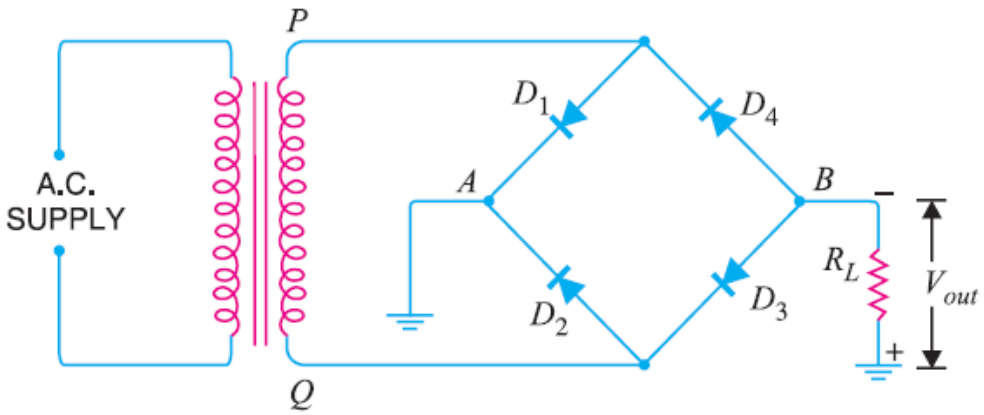
- **The** DC **output is small because each diode utilizes only one half of the transformer's secondary voltage**

Full Wave Bridge Rectifier



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- **It requires 4 diodes.**

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Rectifier efficiency of full wave rectifier is 81.2%**.**

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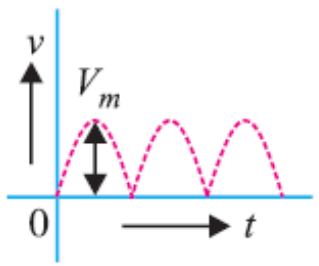
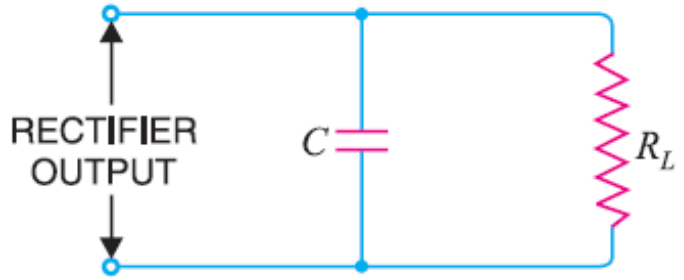
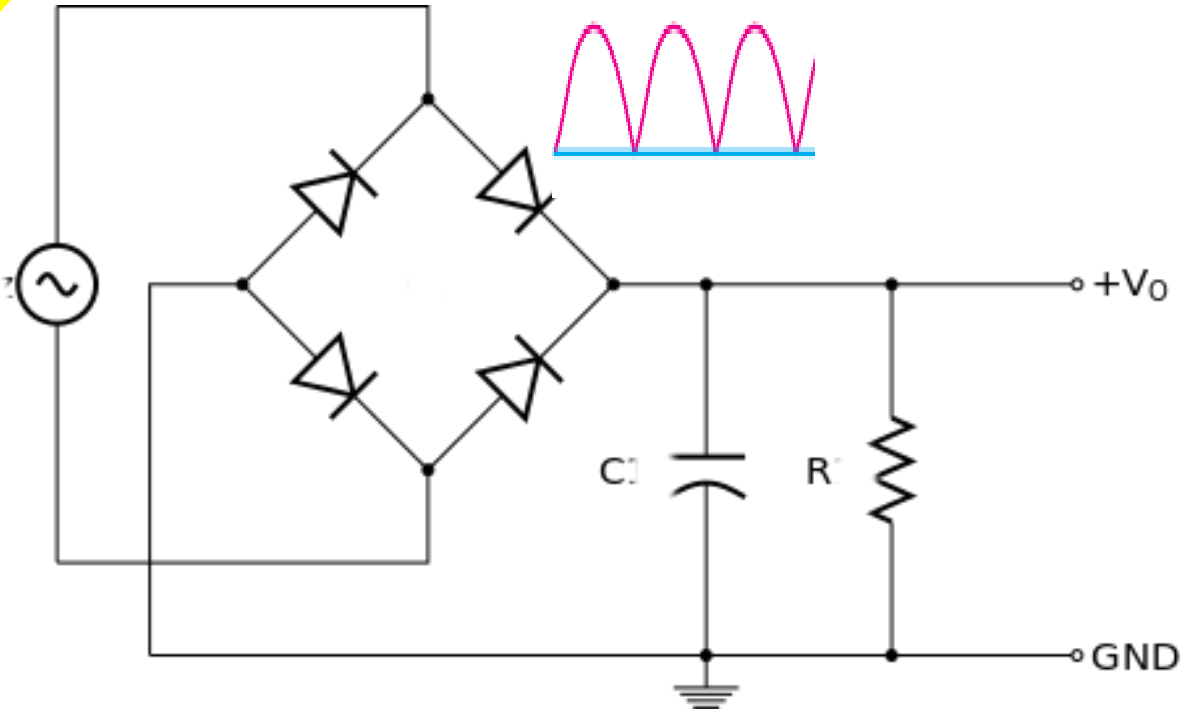




Capacitor Filter



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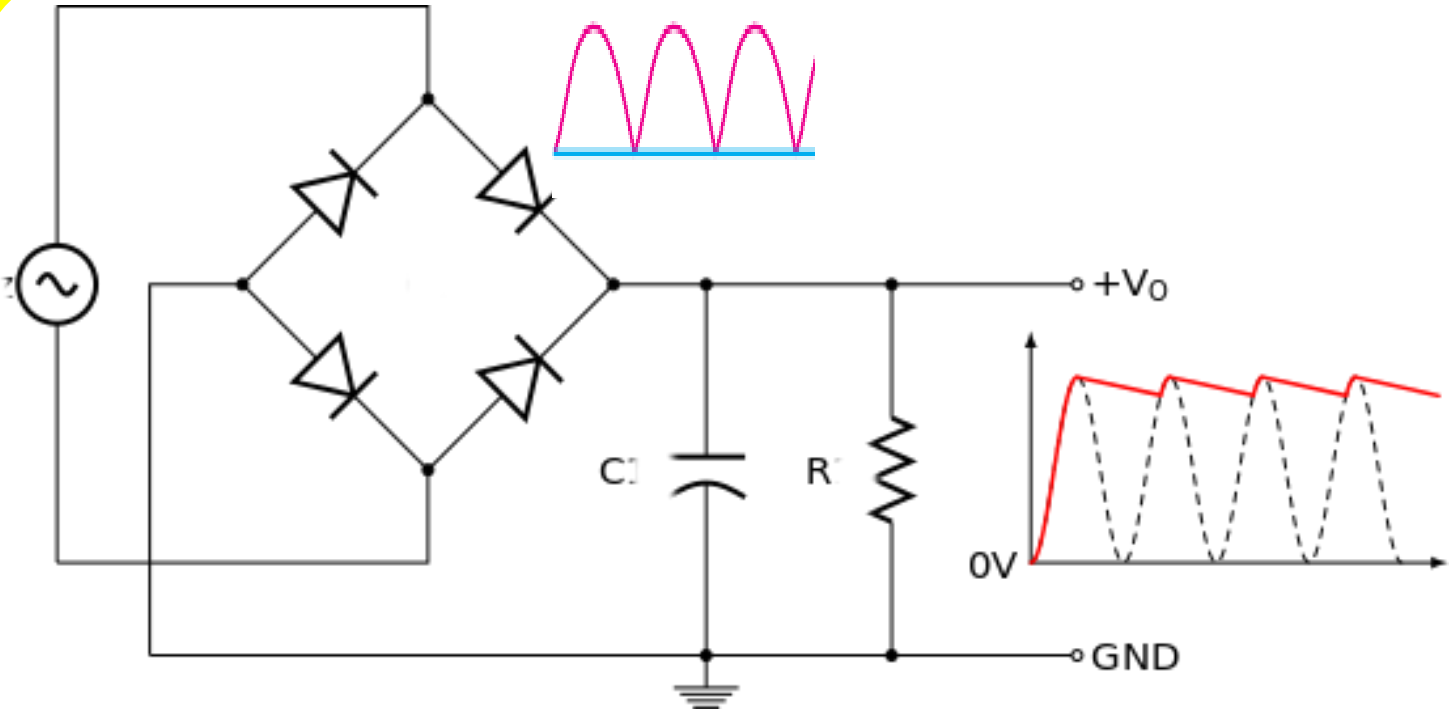

Capacitor Filter

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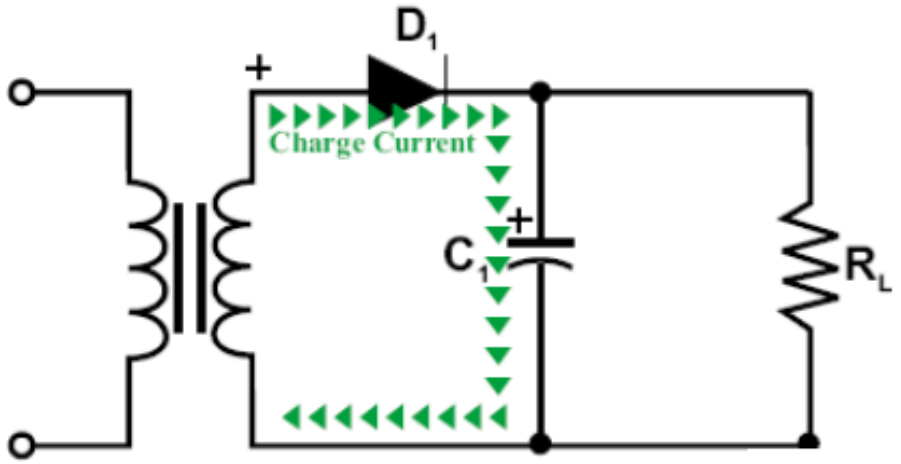
- **Larger the value of capacitor, lesser will be the ripple.**
- **If the load is connected across the filter, the power supply is termed as unregulated power supply.**

Half Wave Rectifier with Filter



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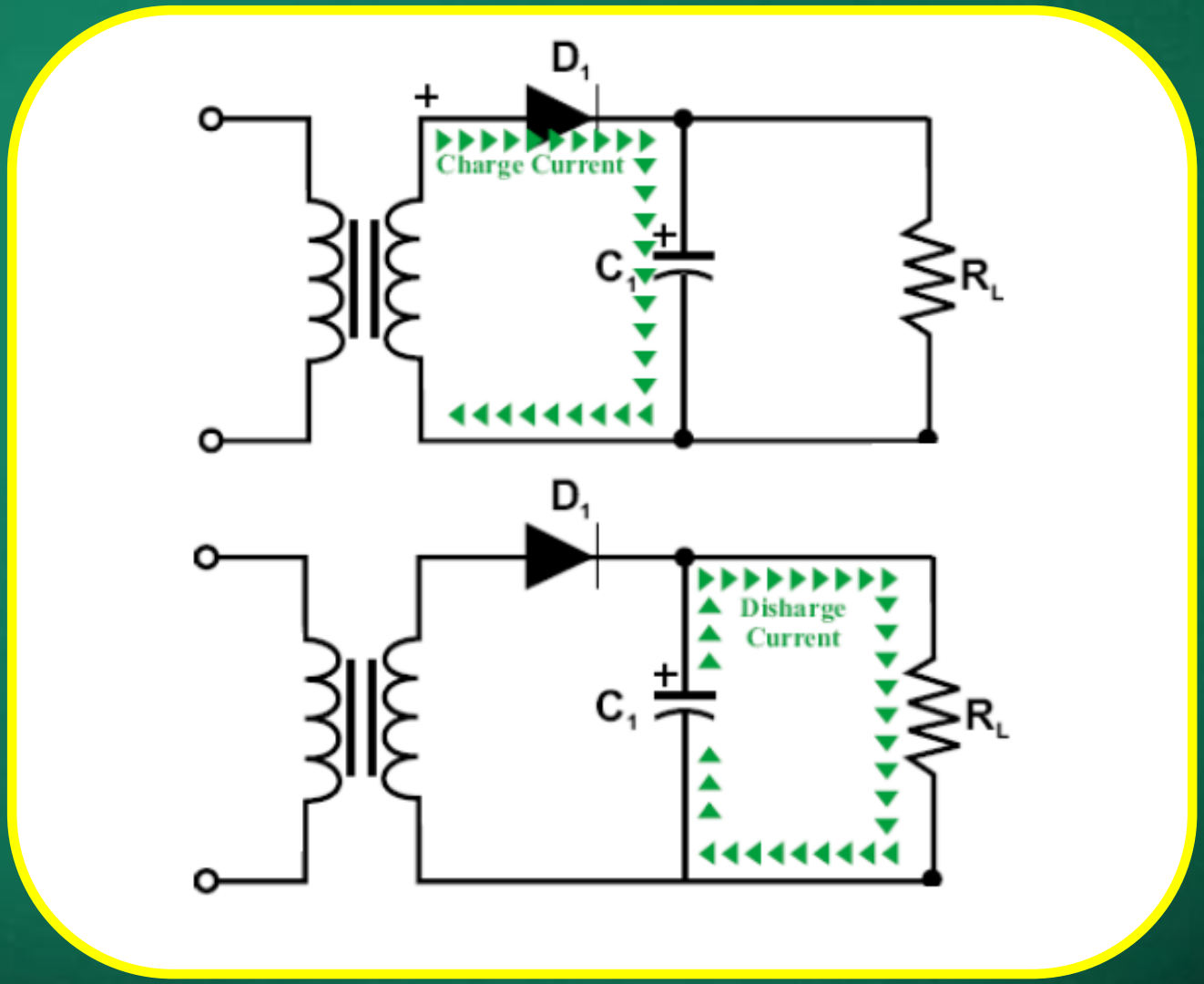

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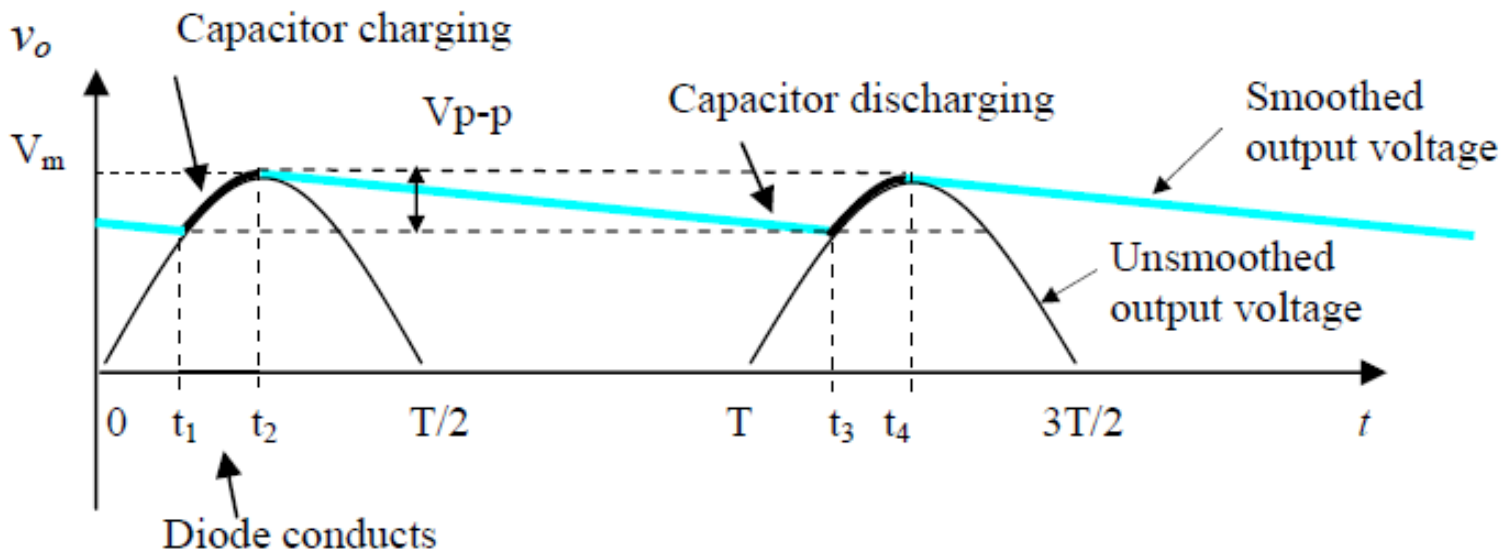

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$$I_L = \frac{V_{avg}}{R_L} \cong \frac{V_m}{R_L}$$

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$$C = \frac{I_L T}{V_{p-p}} \text{ Farads}$$

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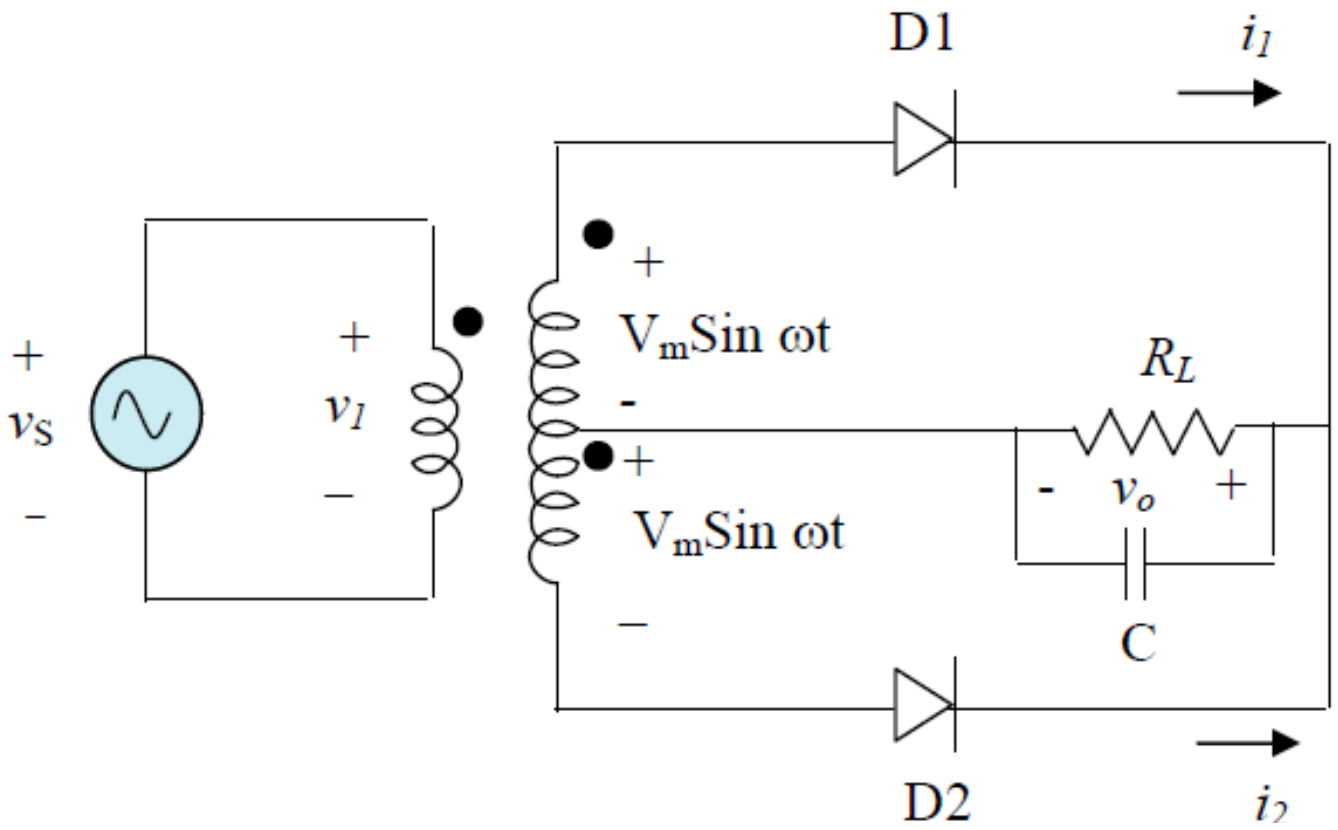
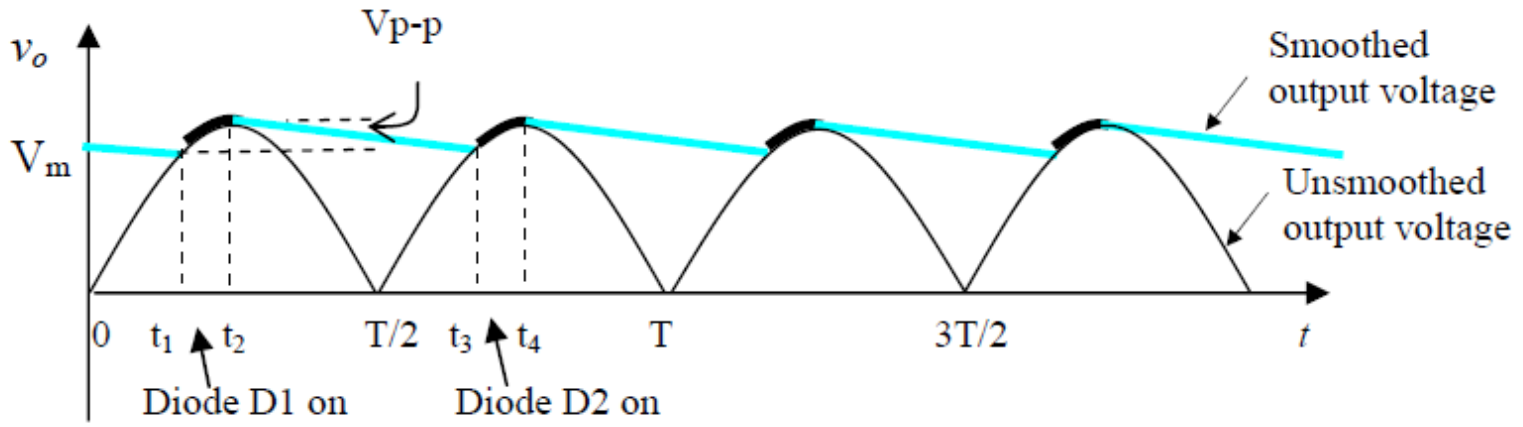
- **If the load is connected across the filter (without regulator), the power supply is termed as unregulated power supply.**

Full Wave Rectifier with Filter



Full Wave Rectifier with Filter



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