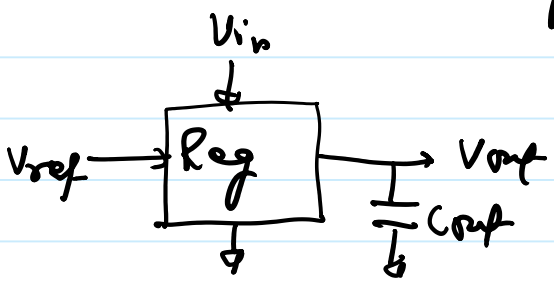
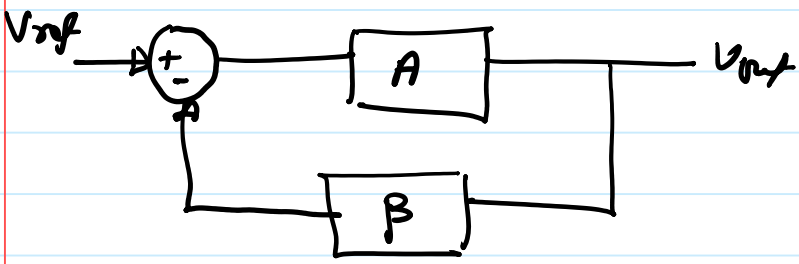
# Regulator's Performance Parameters

1. Voltage Accuracy
2. Efficiency ($\eta$)
3. Quiescent current ($I_Q$)
4. Line Regulation
5. Load Regulation
6. Transient Performance
   a) Load Transient
   b) Line Transient
   c) Settling Time
7. Output Ripple

# Voltage Accuracy/DC Regulation

→ Error in the output Voltage




$$H = \frac{A}{1+A\beta}$$

Assume $\beta = 1$

$$H = \frac{A}{1+A} \qquad A \to \infty$$

$H \approx 1$

$$V_{out} = V_{ref}$$

Practically $A \to 100 \to 1000$

$40dB \to 60dB$

$A = 100$

$\Delta V_{out}$ (error) $\to 1\%$

$A = 1000$

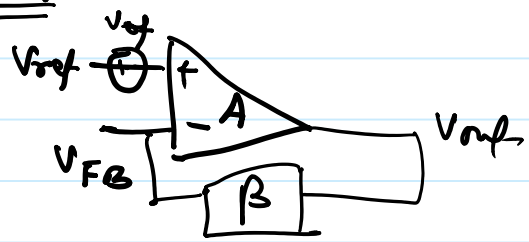
$\Delta V_{out} \to 0.1\%$

# Voltage Accuracy/DC Regulation (Contd.)

$V_{out} \propto V_{ref}$

Any error in $V_{ref}$ is directly reflected at $V_{out}$

**Offset**




$V_{out} = V_{ref} \pm V_{of}$

- Gain
- Vref
- offset

# Power Conversion Efficiency

$$\eta = \frac{P_{out}}{P_{in}} = \frac{P_{out}}{P_{out} + P_{loss}}$$

$$\eta < 1 \text{ or } 100\%$$

$$\frac{P_{in} - P_{loss}}{P_{in}}$$

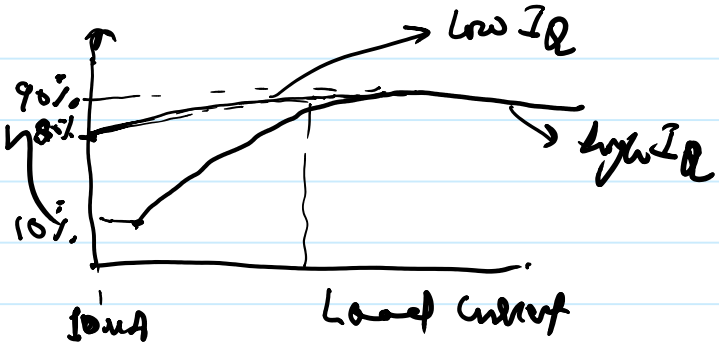
Internal current

⇒ Regulator's current consumption at no load

⇒ minimize $I_Q$

at no load

$P_{out} = 0$



# Line Regulation

Line → Input supply ($V_{in}$)

$$\Delta V_{out\_line} = \frac{\Delta V_{out}}{\Delta V_{in}}$$

$$= \frac{V_{out\_max} - V_{out\_min}}{V_{in\_max} - V_{in\_min}}$$

$\Rightarrow$ % $\Delta V_{out}/V$ unit

or $\Delta V_{out}/V$

# Load Regulation

$$\Delta V_{out\_load} = \frac{\Delta V_{out}}{\Delta I_{out}}$$

Line Transient

$$\Delta V_{out\_line\_tran} = \frac{\Delta V_{out}}{\Delta V_{in\,(step)}}$$