RRB JE | SSE 2023

Foundation Batch

Analog Electronics

Day-3

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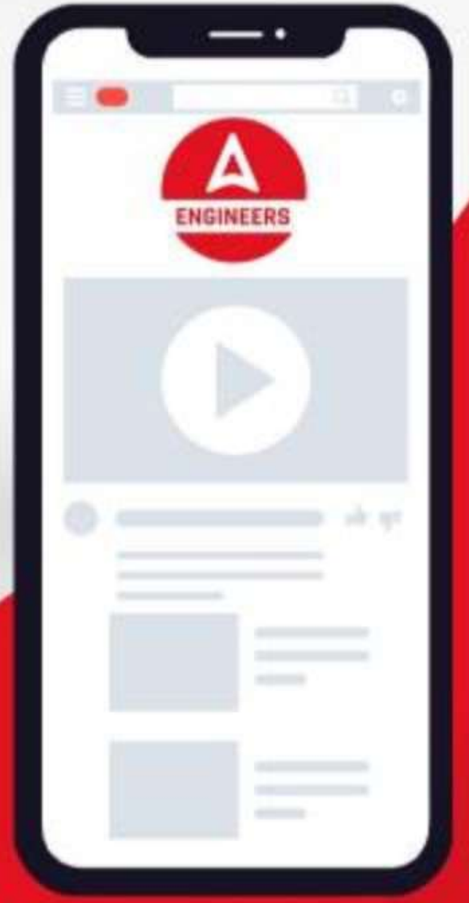

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Voltage

Transcond. $G_T = \frac{I_o \rightarrow \text{Output}}{V_i \rightarrow \text{Voltage}}$

Transresistance $R_m = \frac{V_o \rightarrow \text{output}}{I_i \rightarrow \text{Current}}$

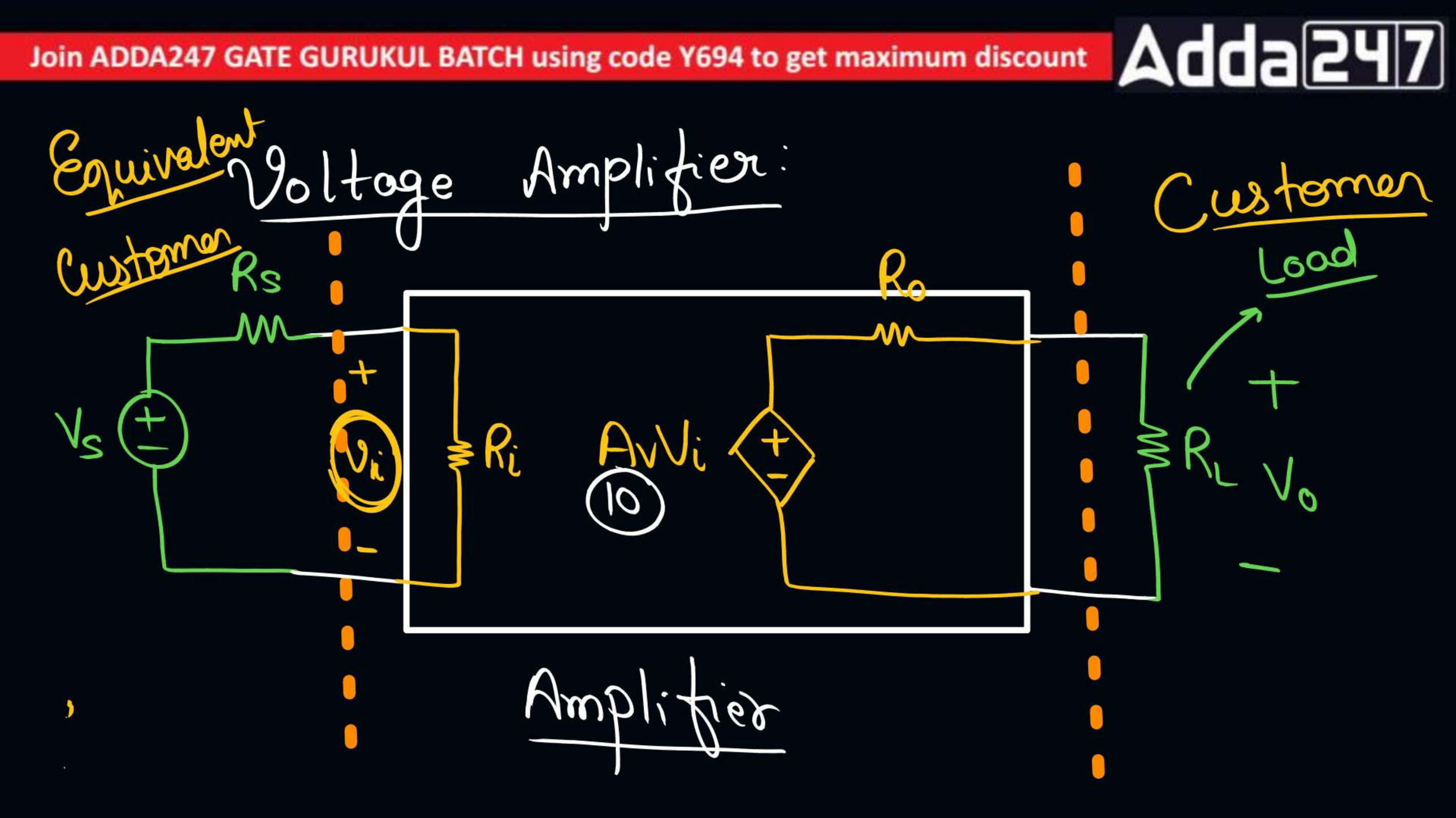
$= \frac{1}{G_T}$

Current :

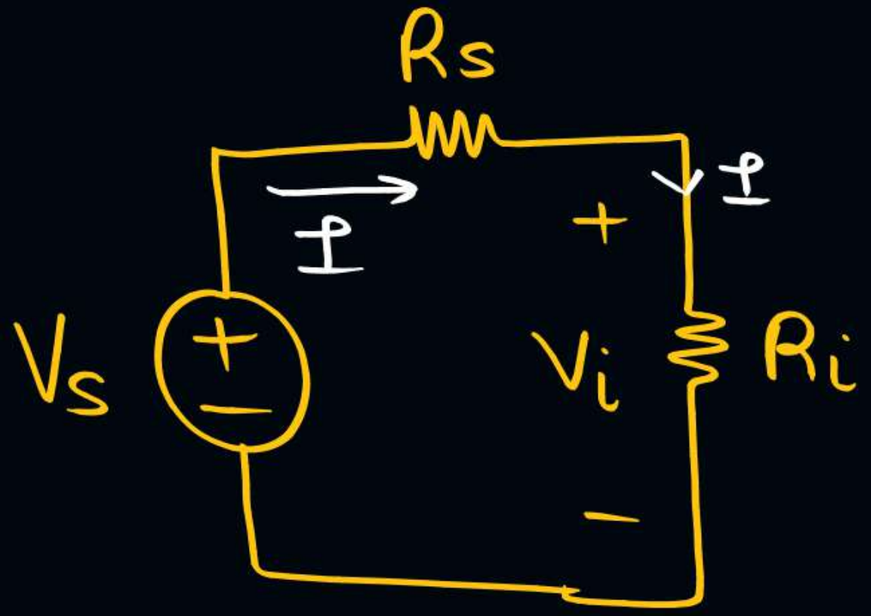
$$A_I = \frac{I_o}{I_i}$$

$I_o \rightarrow$ Output

$I_i \rightarrow$ Input



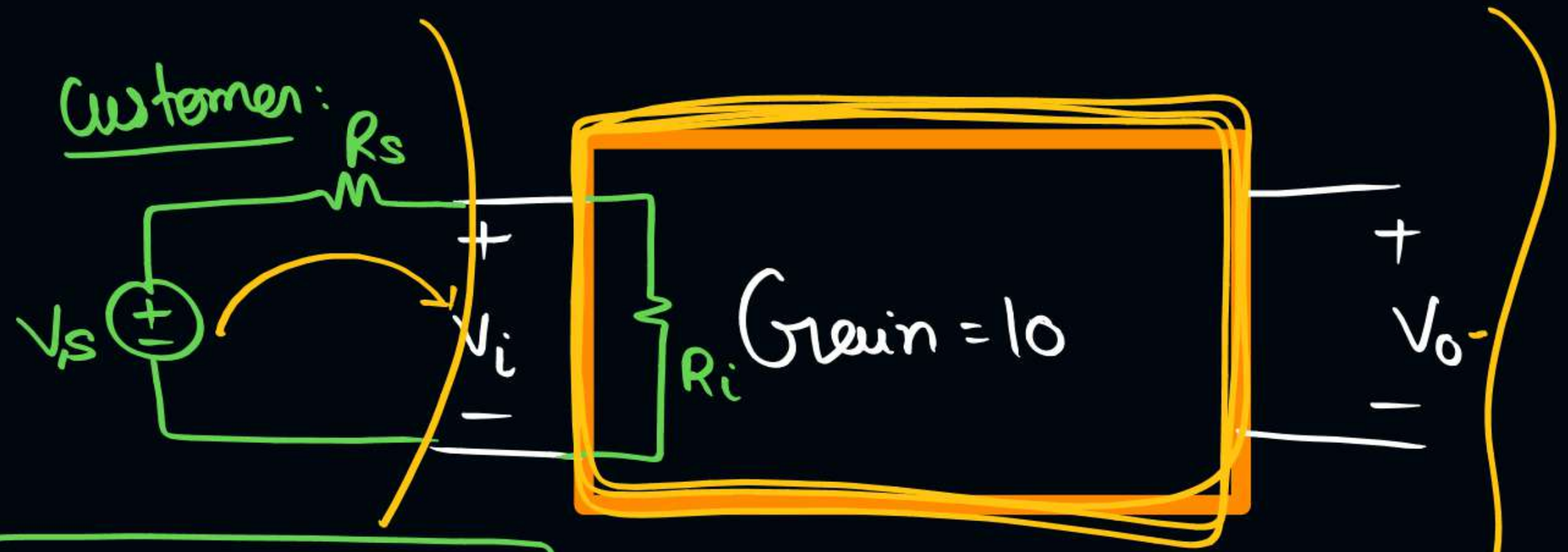
R_i → Input Resistance of Voltage Amplifier



$$I = \frac{V_s}{R_s + R_i}$$

$$V_i = I \cdot R_i$$

$$\boxed{V_i = \frac{V_s \cdot R_i}{R_i + R_s}}$$

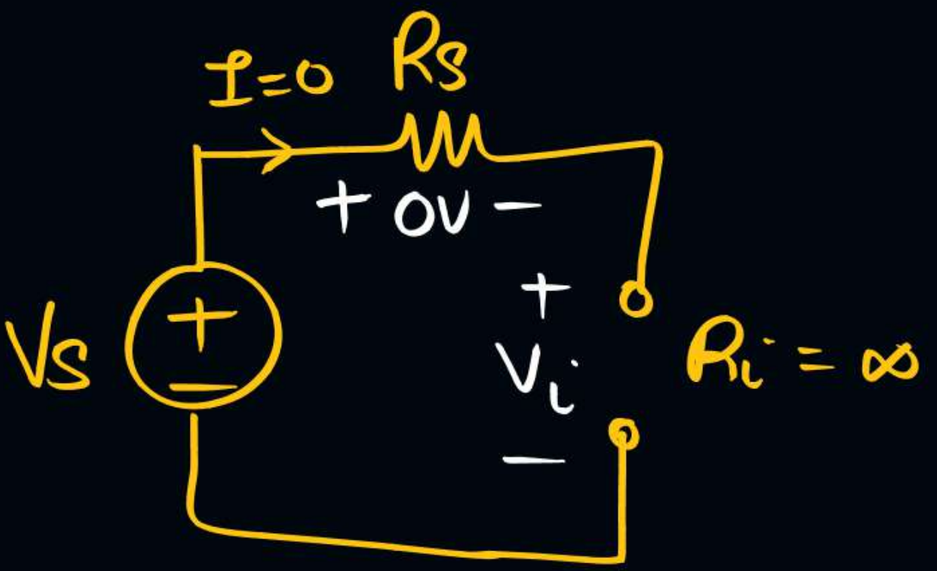


$$V_i = \frac{R_i}{R_i + R_s} V_s$$

$$V_o = 10 V_i$$

$$\frac{V_o}{V_i} = 10$$

$$V_i = \frac{R_i}{R_i + R_s} \cdot V_s$$



Condition: $V_i = V_s$:

① $R_i = \infty$ (Ideal)

R_i = Very very high (Practically)

= 1MΩ

$V_s = 0 + V_i$

$$V_s = V_i$$

Voltage Amplifier:

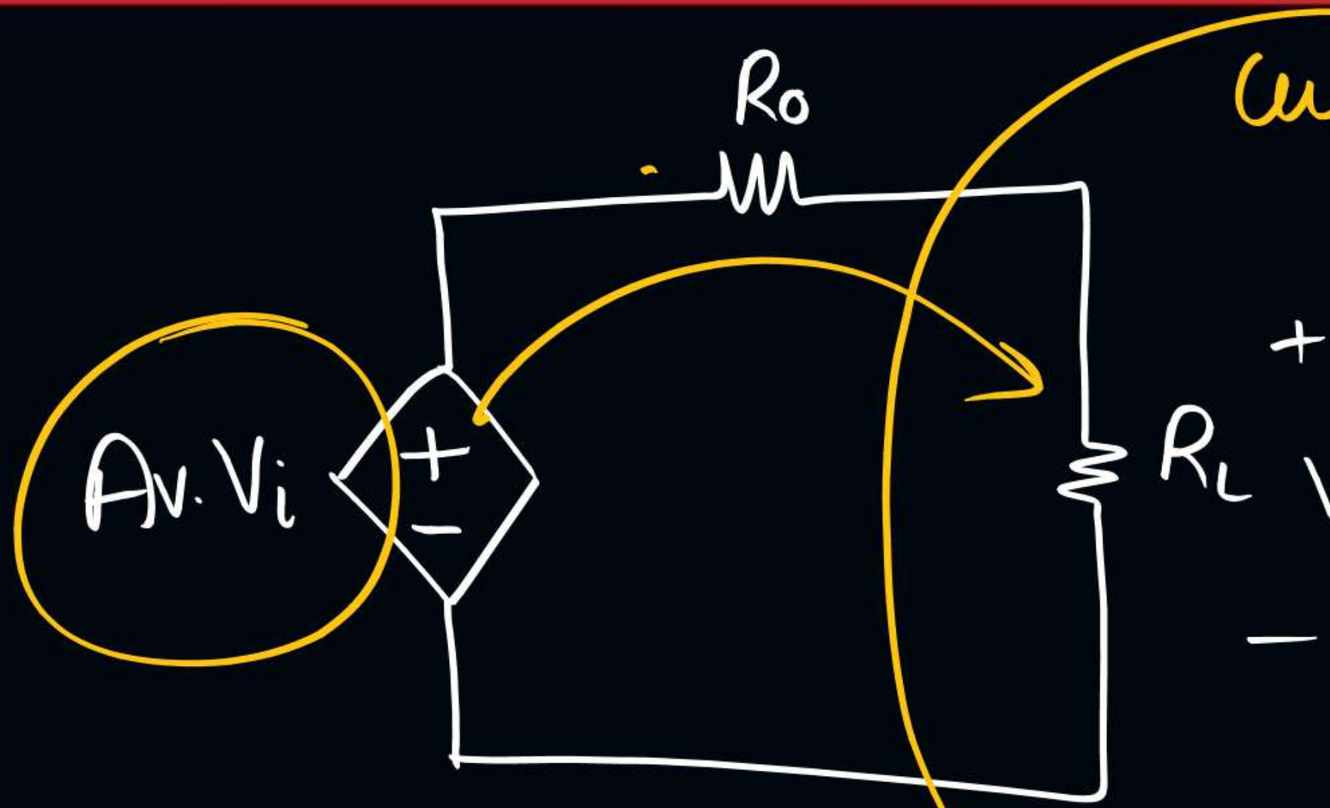
$R_i = \infty$ (Ideally)

= very very high (Practically)

= 1 MΩ

$R_i = \infty$:

$$v_i = V_s$$



$$V_o = \frac{R_L}{R_L + R_o}(A_v \cdot V_i)$$

$$\boxed{V_i = V_s}$$

$$V_o = \frac{R_L}{R_L + R_o} \cdot A_v \cdot V_s$$

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$R_o = 0$ (Ideally)

R_o = very very low

$$V_o = \frac{R_L}{R_L + R_o} \cdot A_v \cdot V_s$$

$R_o \to 0$

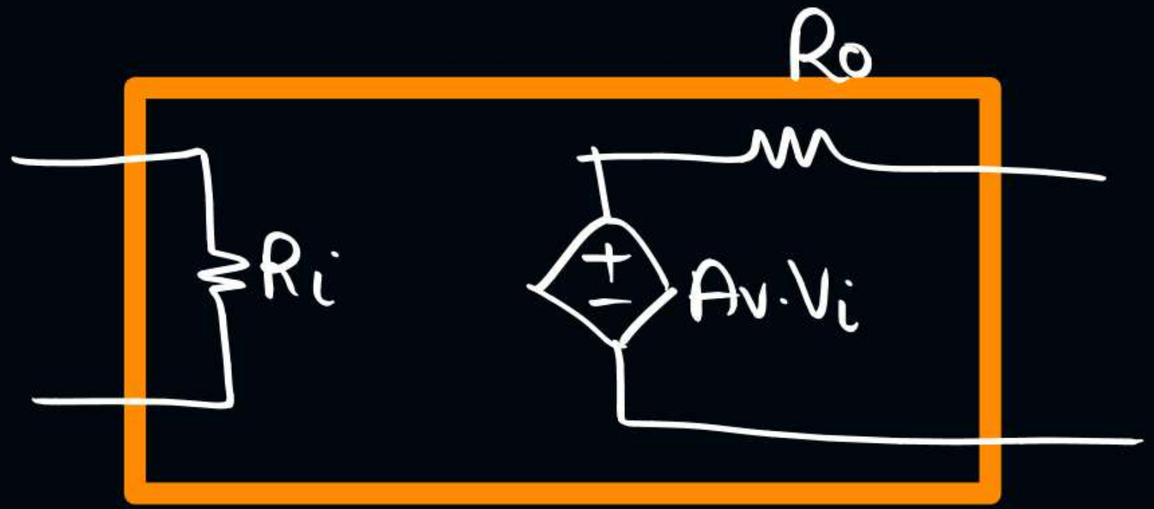
$$\boxed{V_o = A_v \cdot V_s}$$

$$\boxed{A_v = \frac{V_o}{V_s}}$$

$$\boxed{V_o = 10\, V_s}$$

If $A_v = 10$

Voltage Amplifier:



$$A_V = \frac{V_o}{V_i}$$

$R_i = \infty$ (Ideally)

R_i = V.V. high (Practically)

$R_o = 0$ (Ideally)

R_o = V.V. low (Practically)

Operational Amplifier is Voltage Amplifier:

a) Input Resistance of OP-Amp is ∞

b) Output Resistance of OP-Amp is 0

Operational Amplifier:

Char.	Ideal	Practical
R_i	∞	$10^6\ \Omega$
R_o	0	$10-100\ \Omega$
A_V (Gain)	∞	10^6

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Ideal

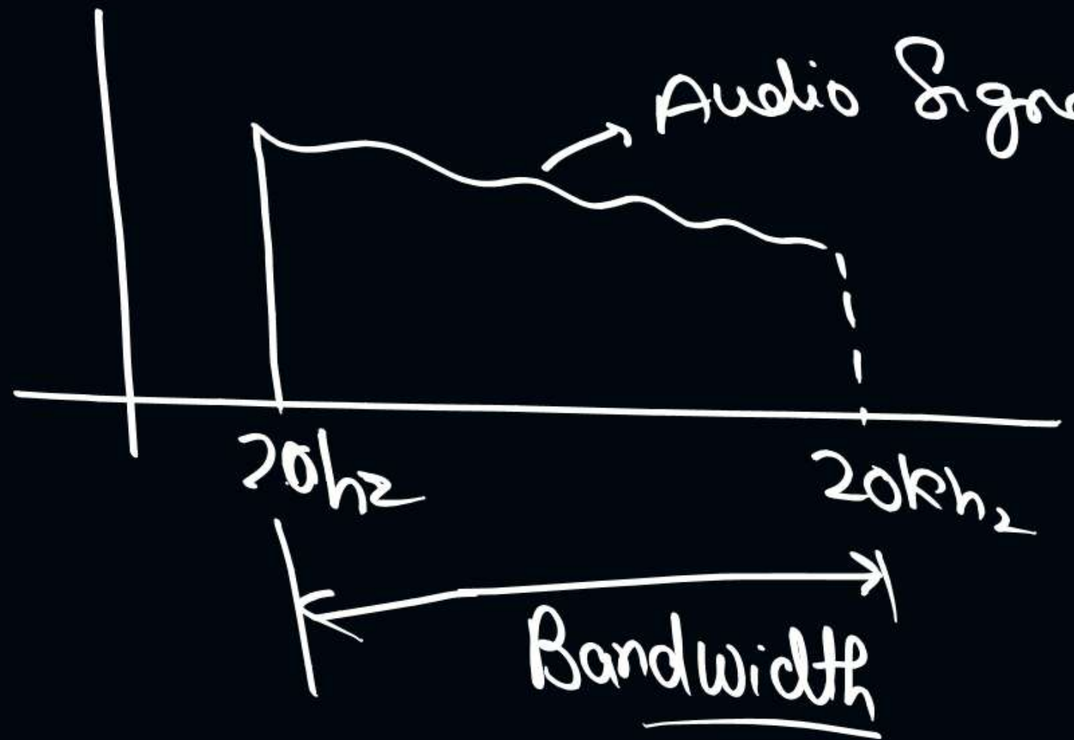
Practical

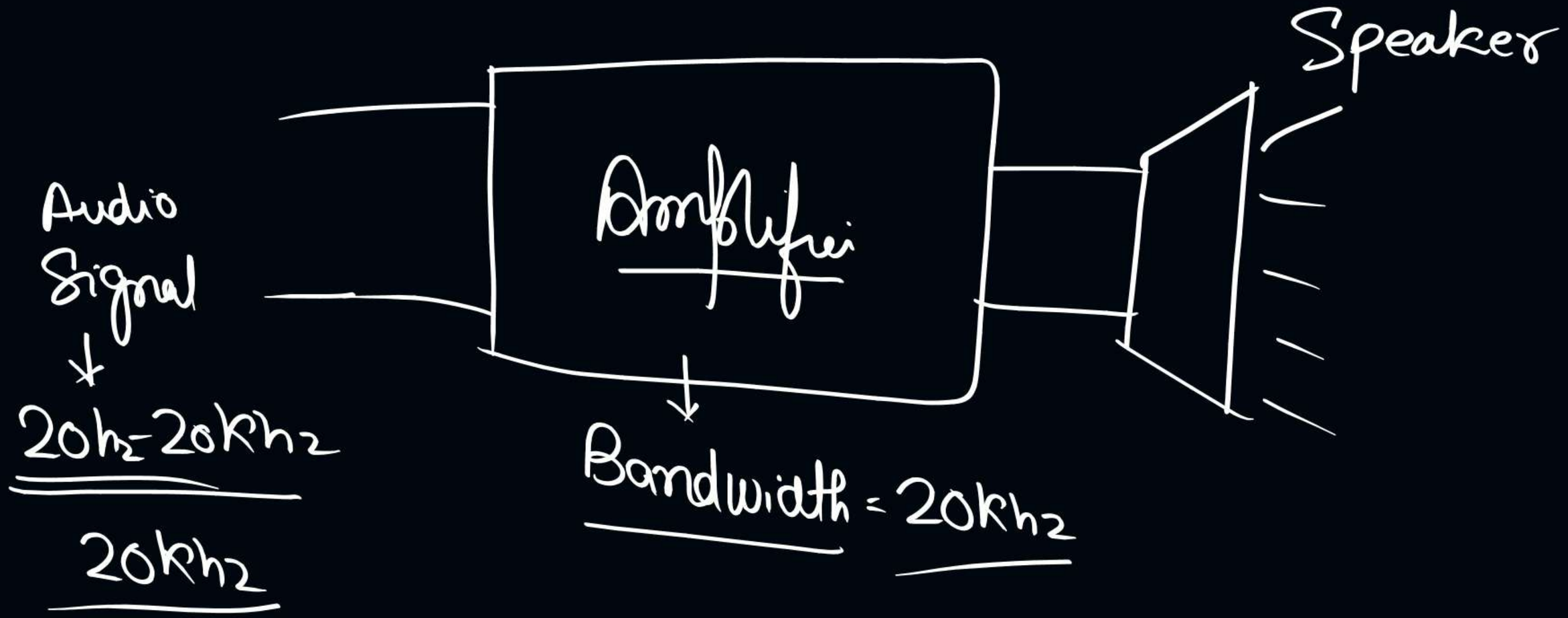
Bandwidth

Bandwidth:

- → Voice Signal →
- → Audio Signal → Electrical generated Signal

Audio Signal: 20hz → 20Khz





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Basics of OP-Amp

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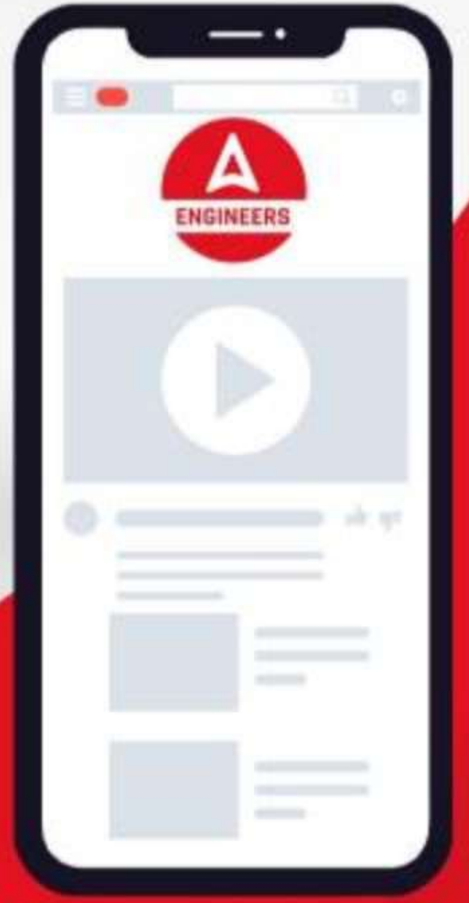

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