



Lecture

Wide-Band Differential Amplifier

Vincent Chang

Outline

Intro

- Concept
- CC-CB

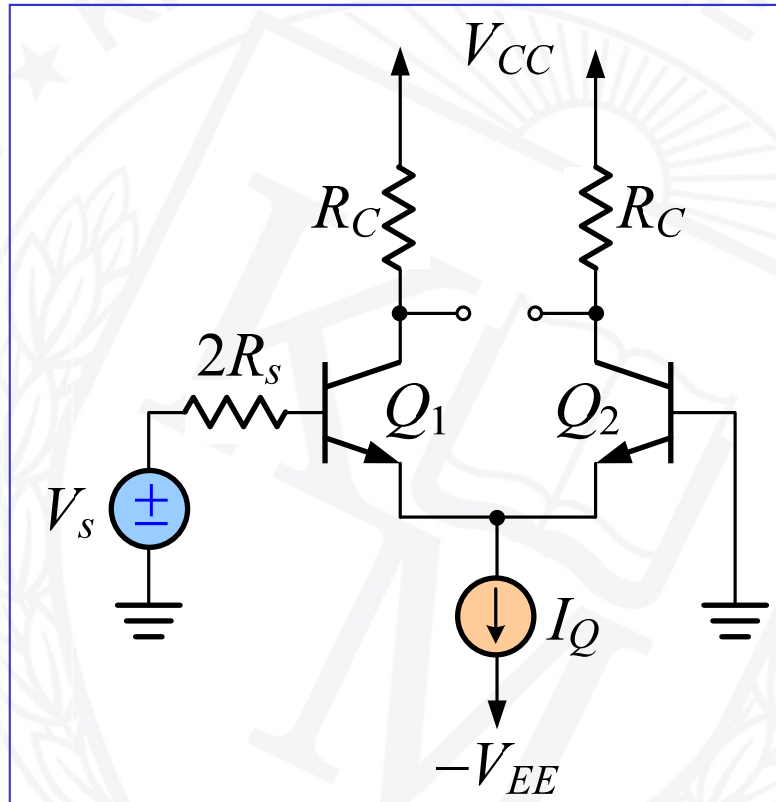
Inspection

- Pole 1
- Pole 2

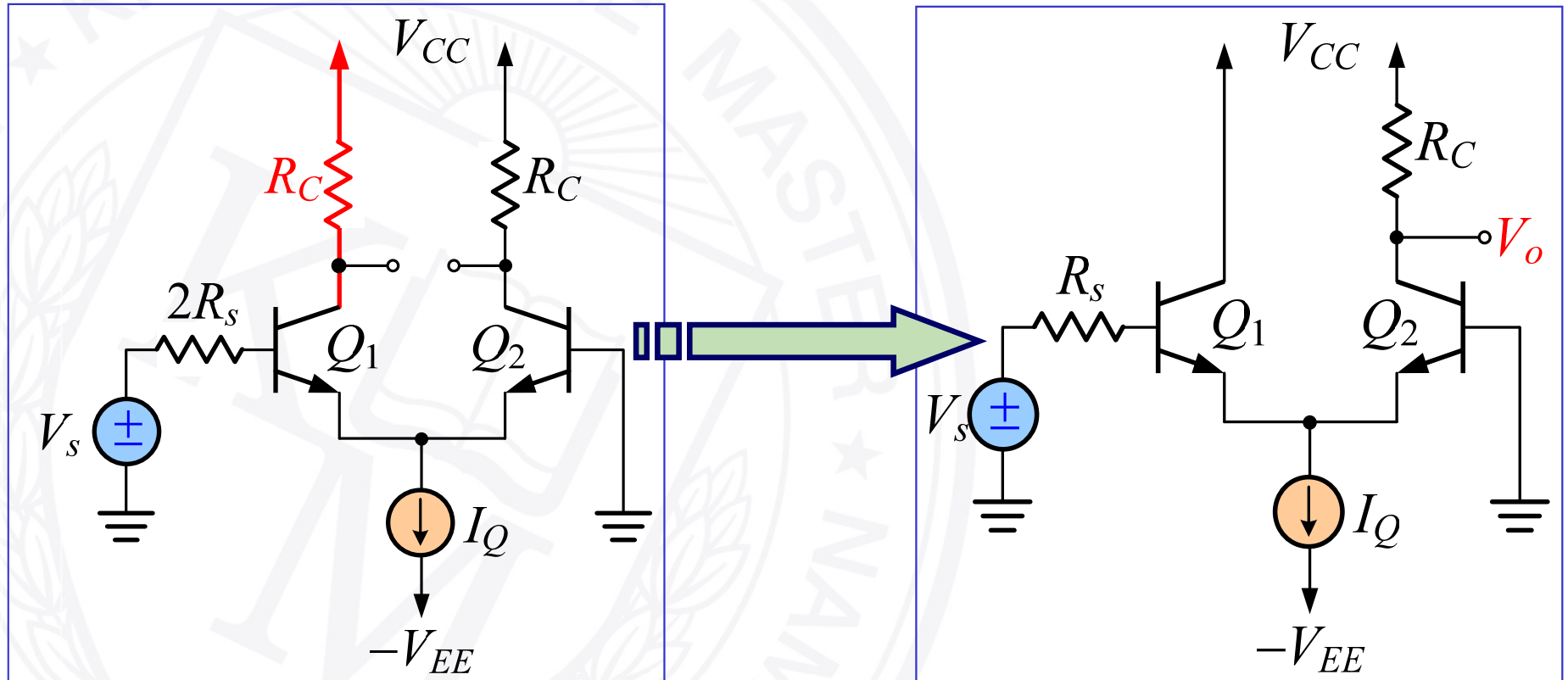
Model

- Evolution
- Poles
- Transfer function

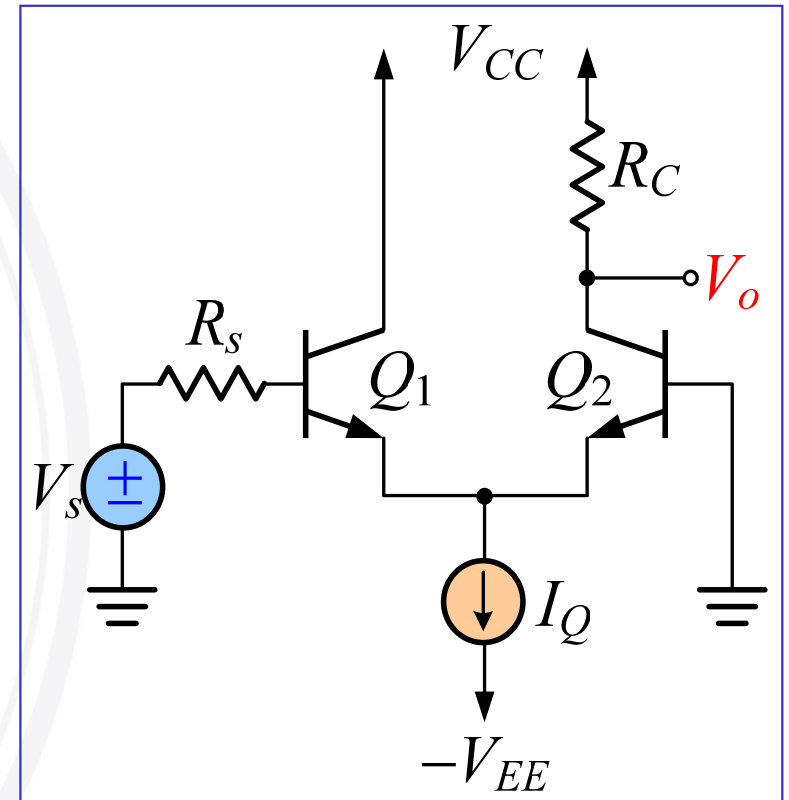
Differential Amplifier



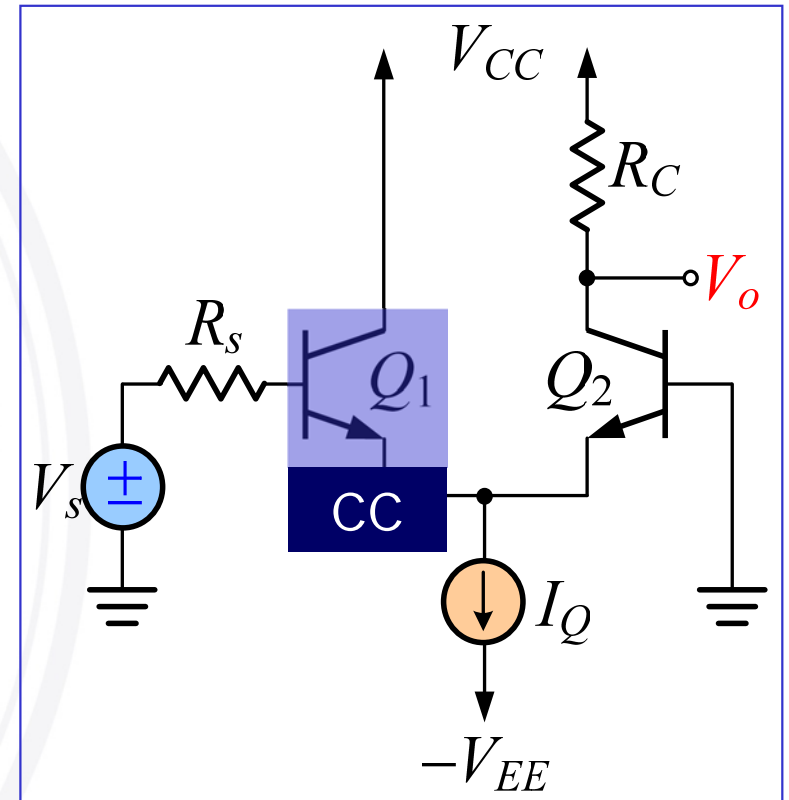
Differential Amplifiers



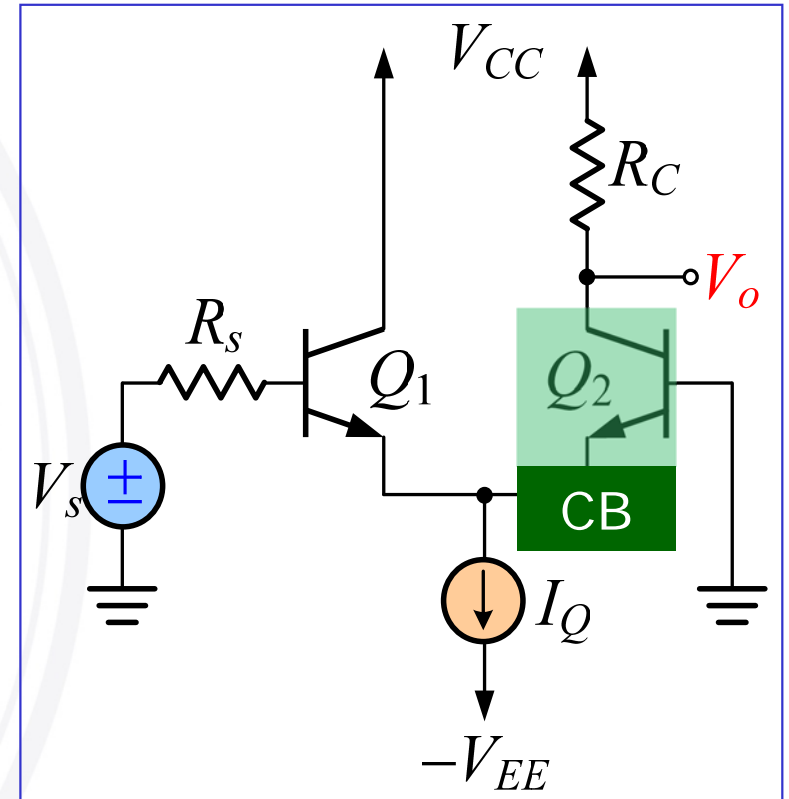
Wideband D-Amp



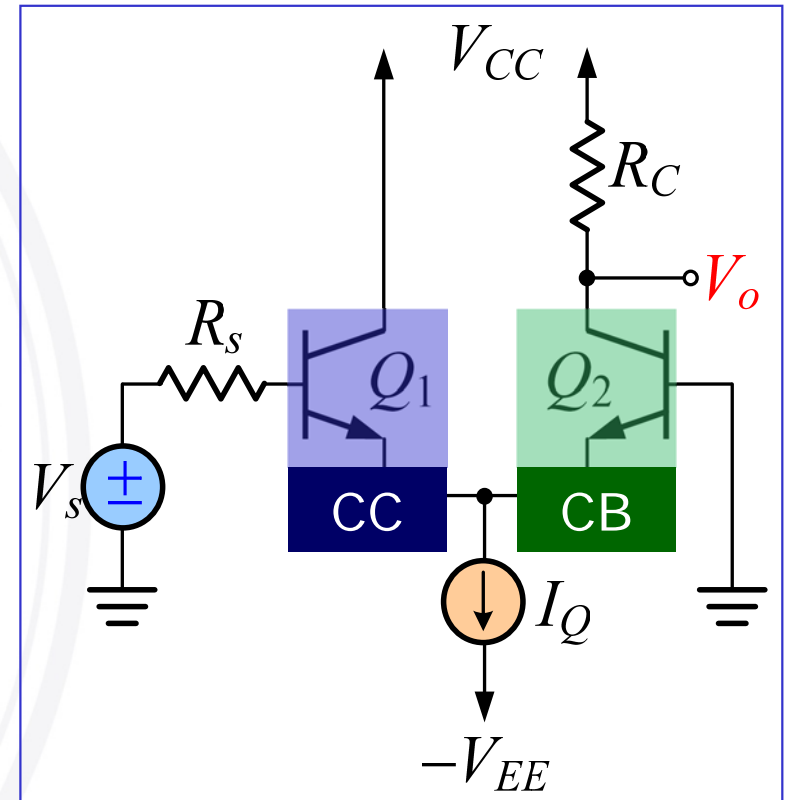
CC Configuration



CB Configuration



CC-CB



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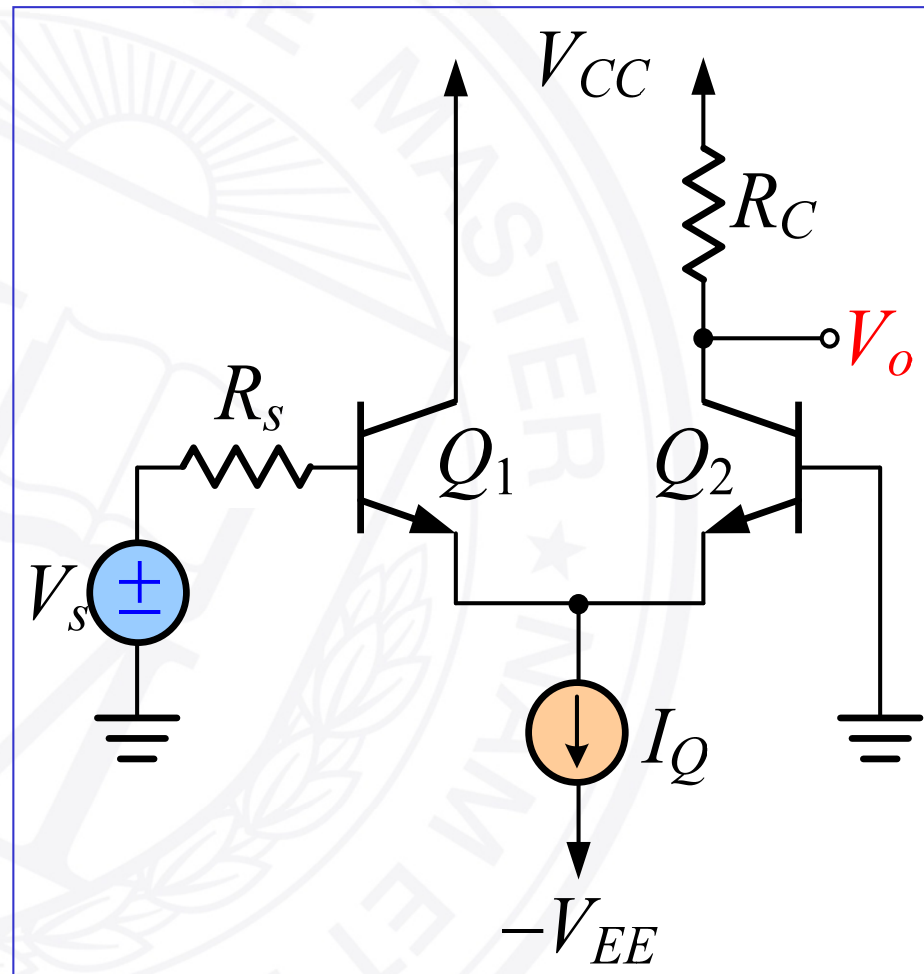
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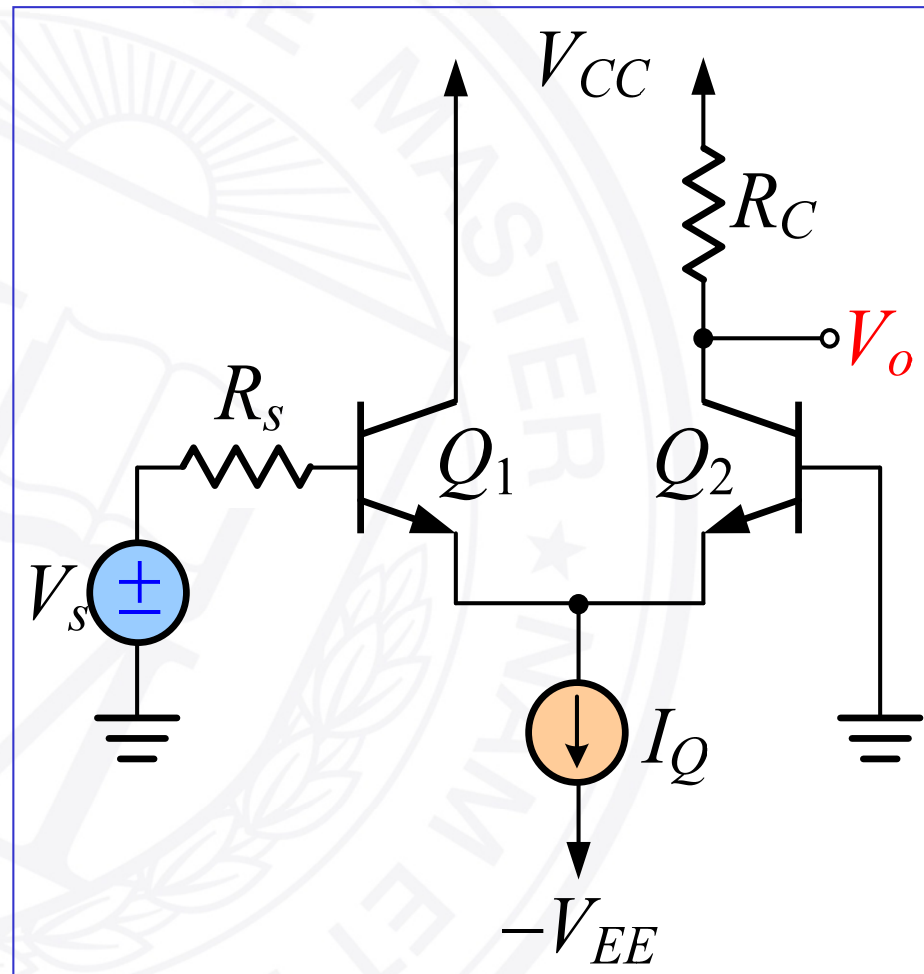
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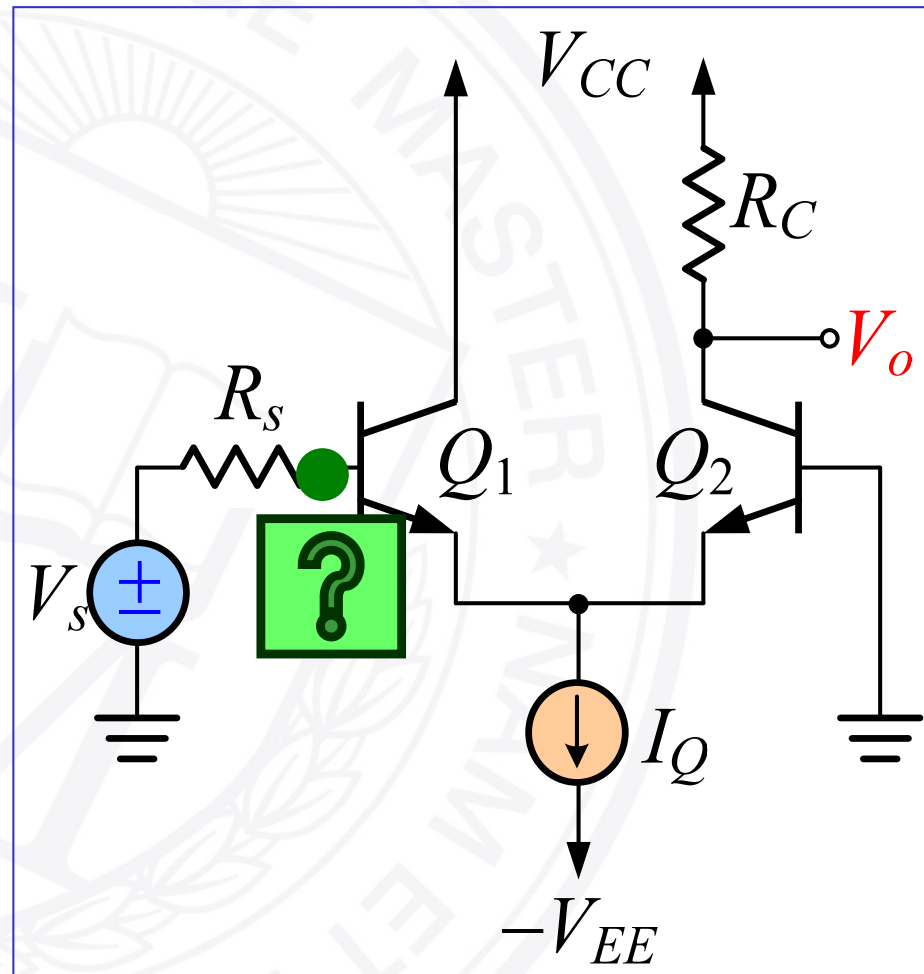
Analysis by Inspection



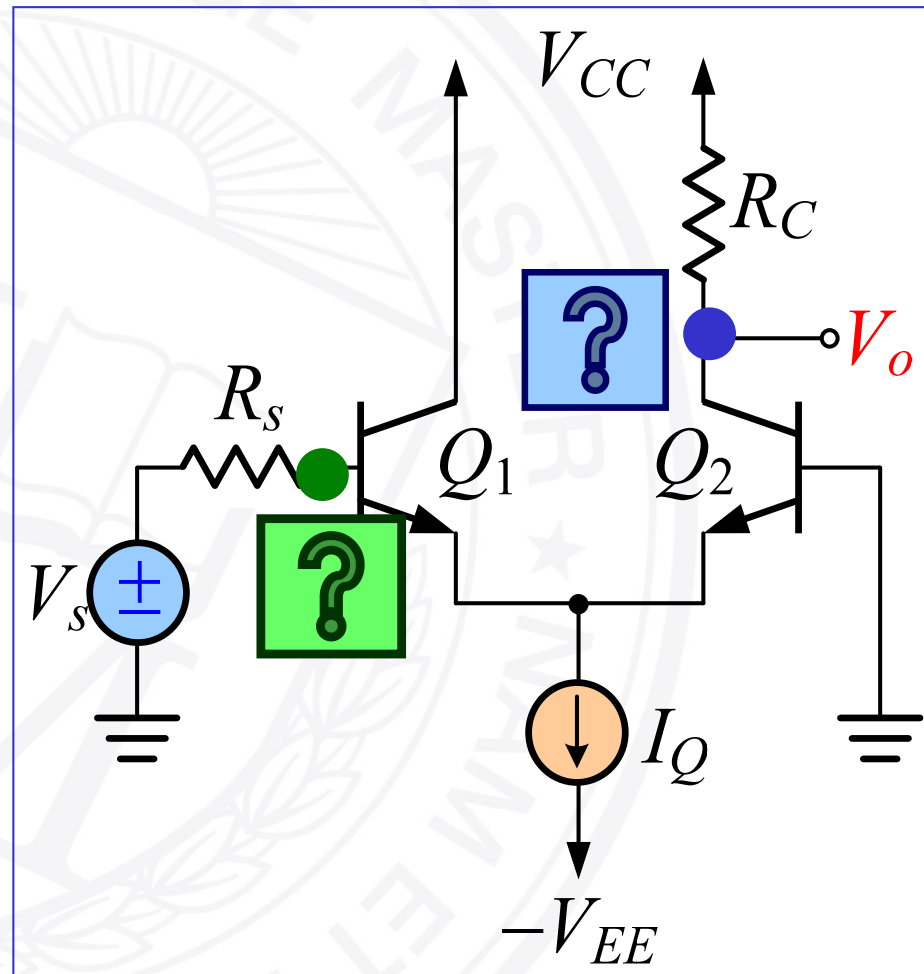
Analysis by Inspection



Analysis by Inspection

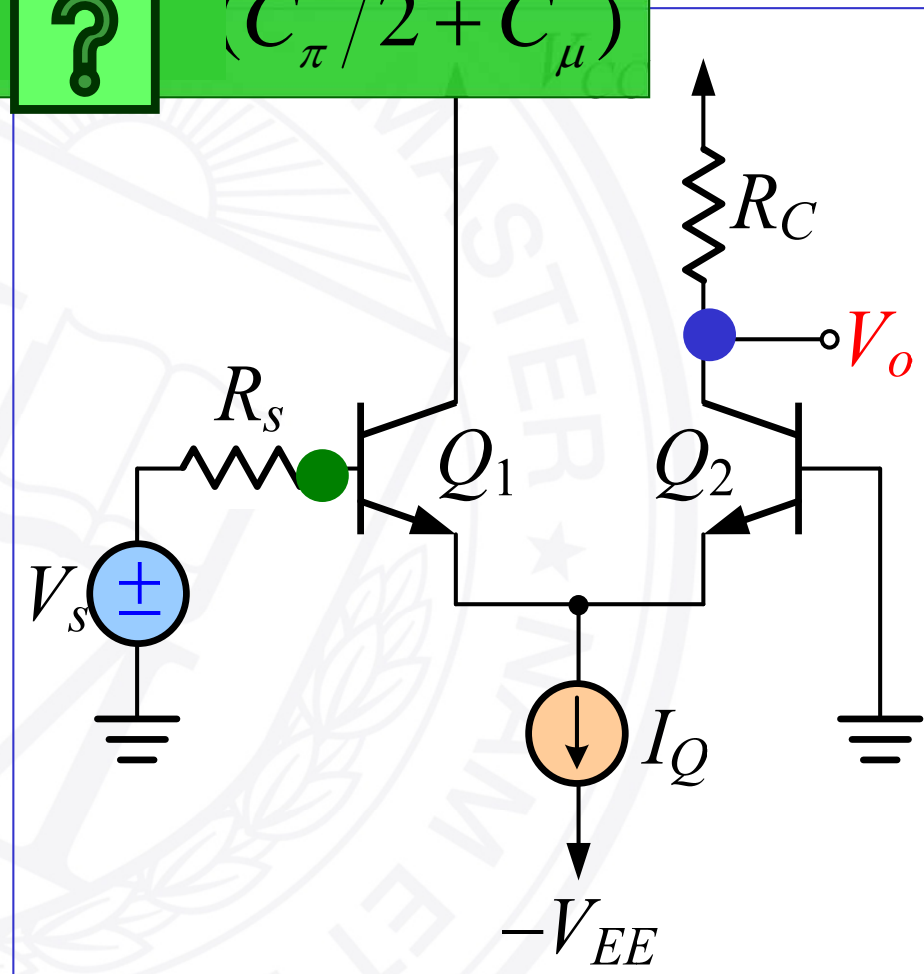


Analysis by Inspection



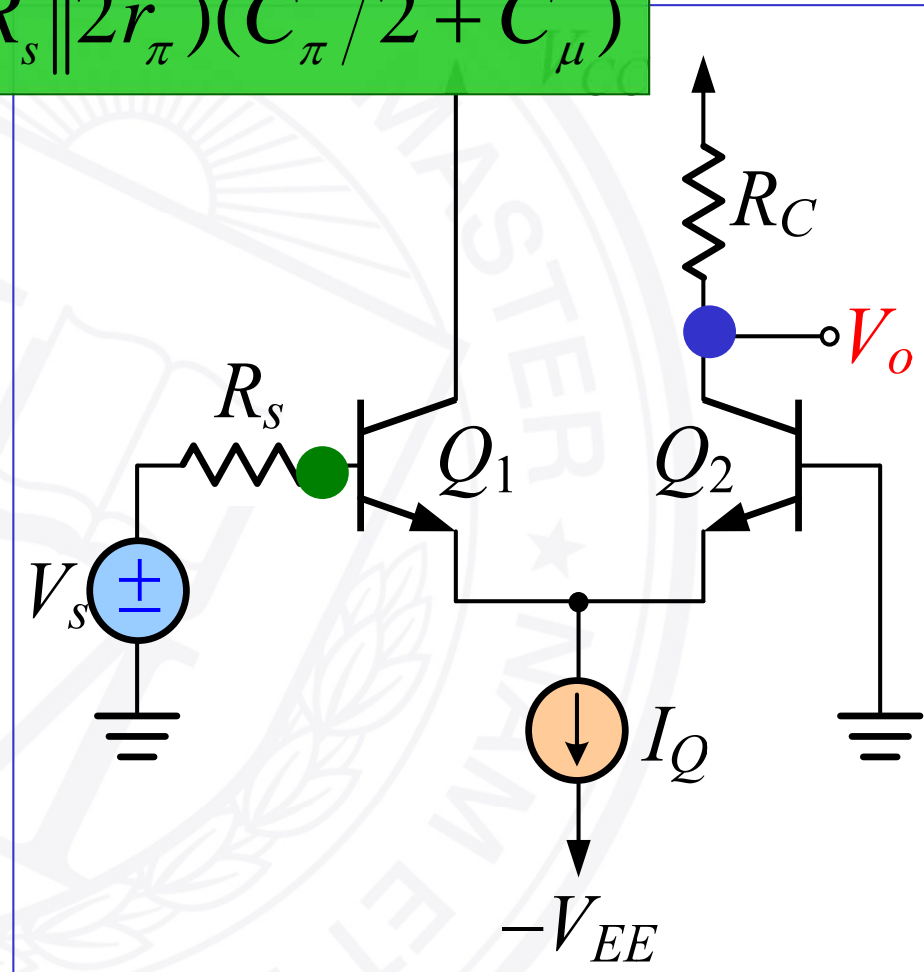
Analysis by Inspection

$$\omega_{HP1} = \frac{1}{\boxed{?} (C_{\pi}/2 + C_{\mu})}$$



Analysis by Inspection

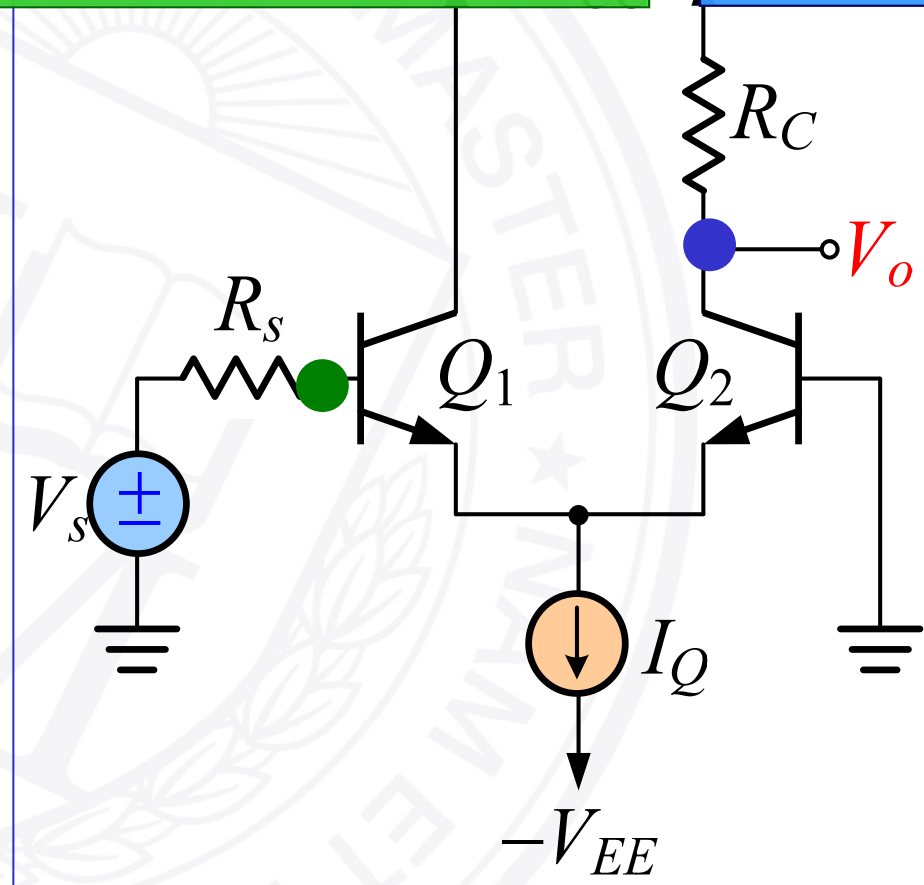
$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$



Analysis by Inspection

$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$

$$\omega_{HP2} = \frac{1}{R_C C_\mu}$$



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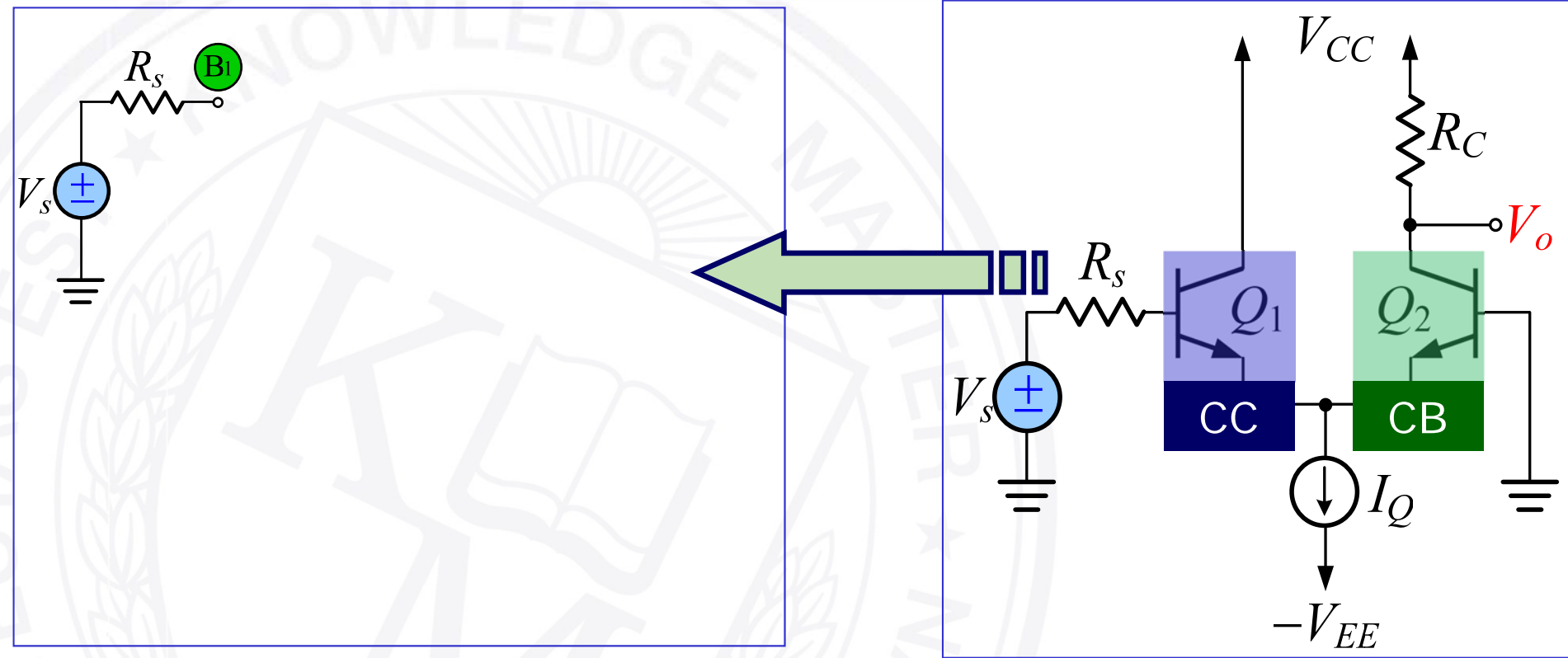
Inspection

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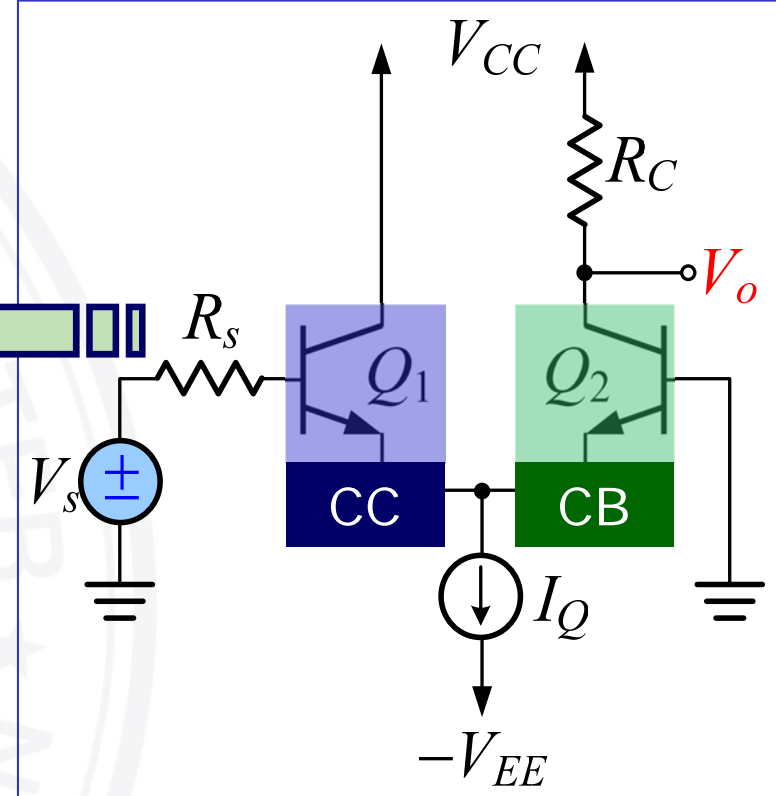
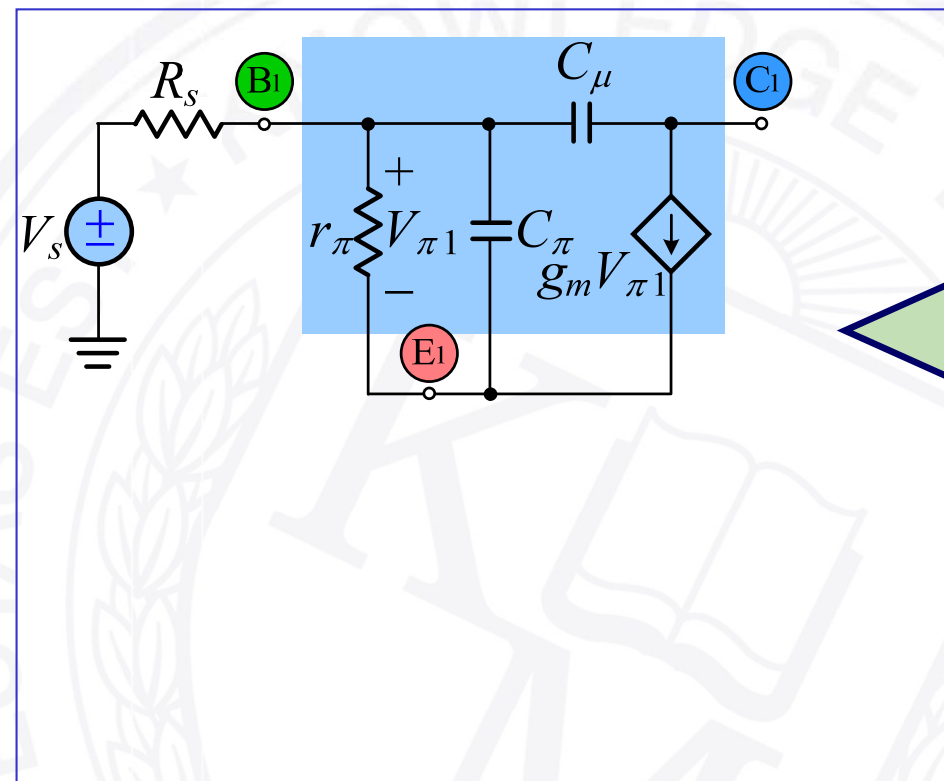
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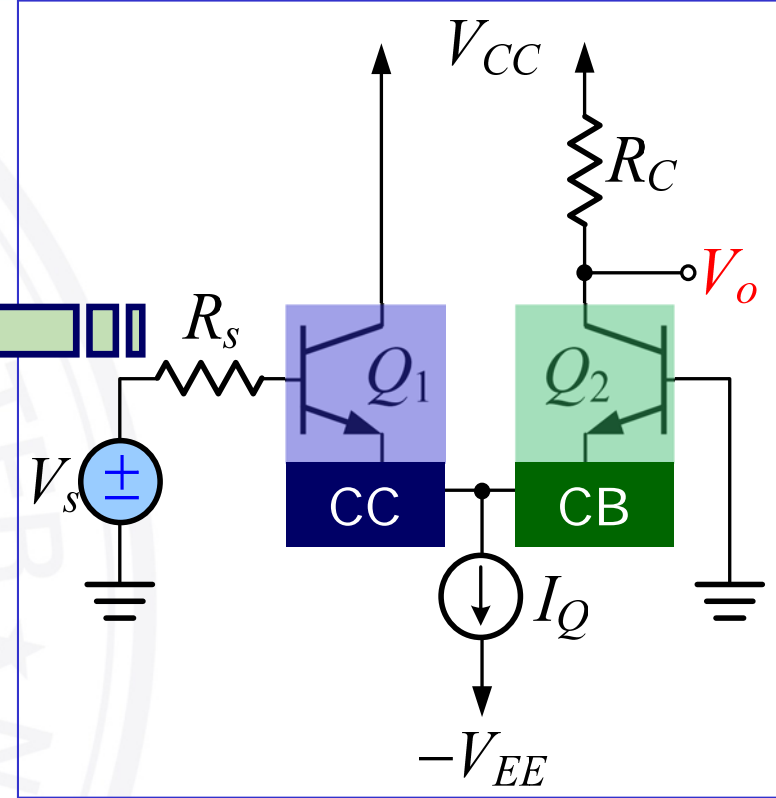
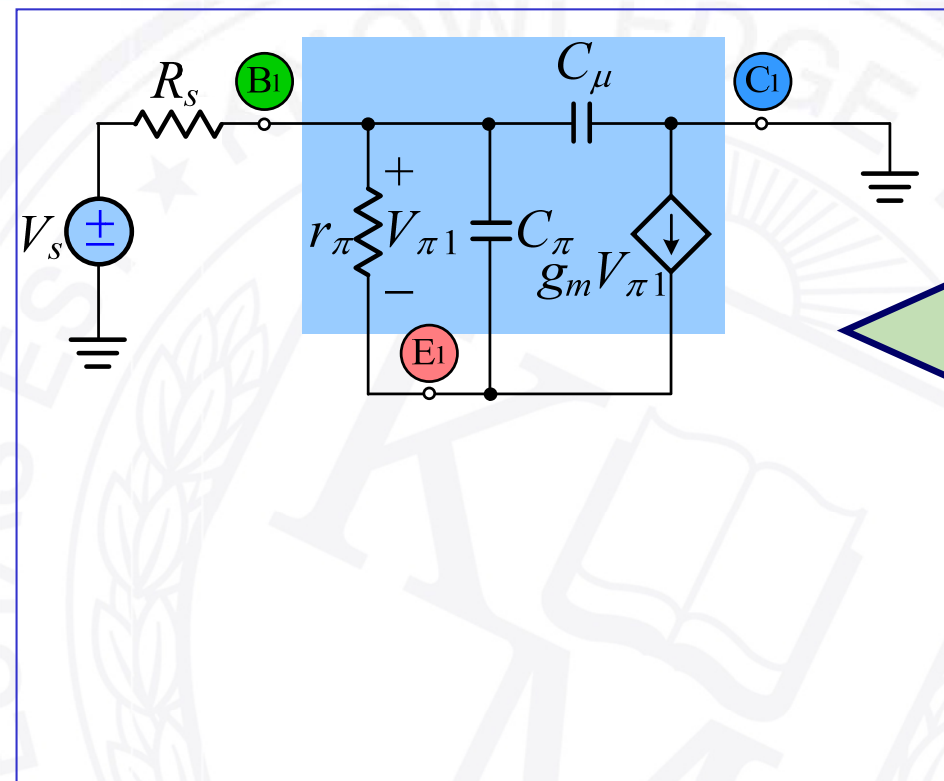
HF Equivalent Circuit



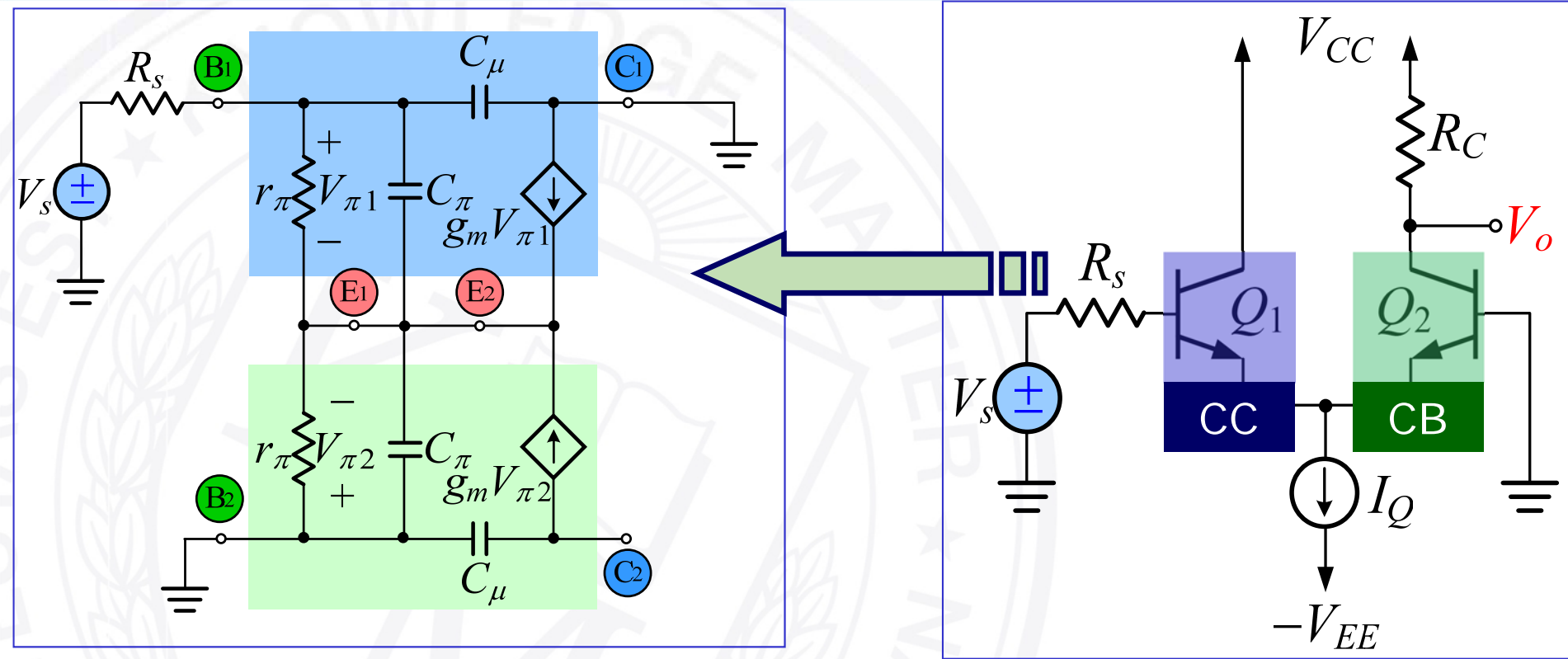
HF Equivalent Circuit



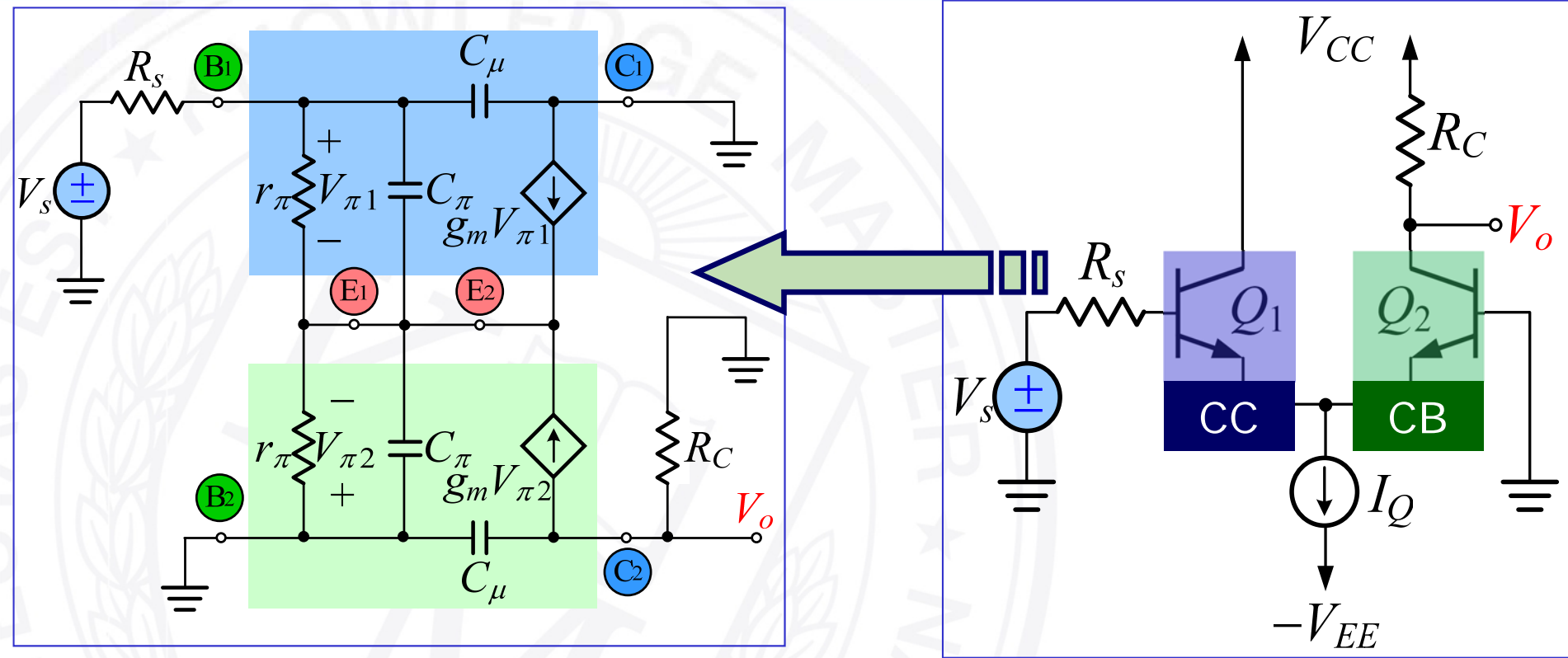
HF Equivalent Circuit



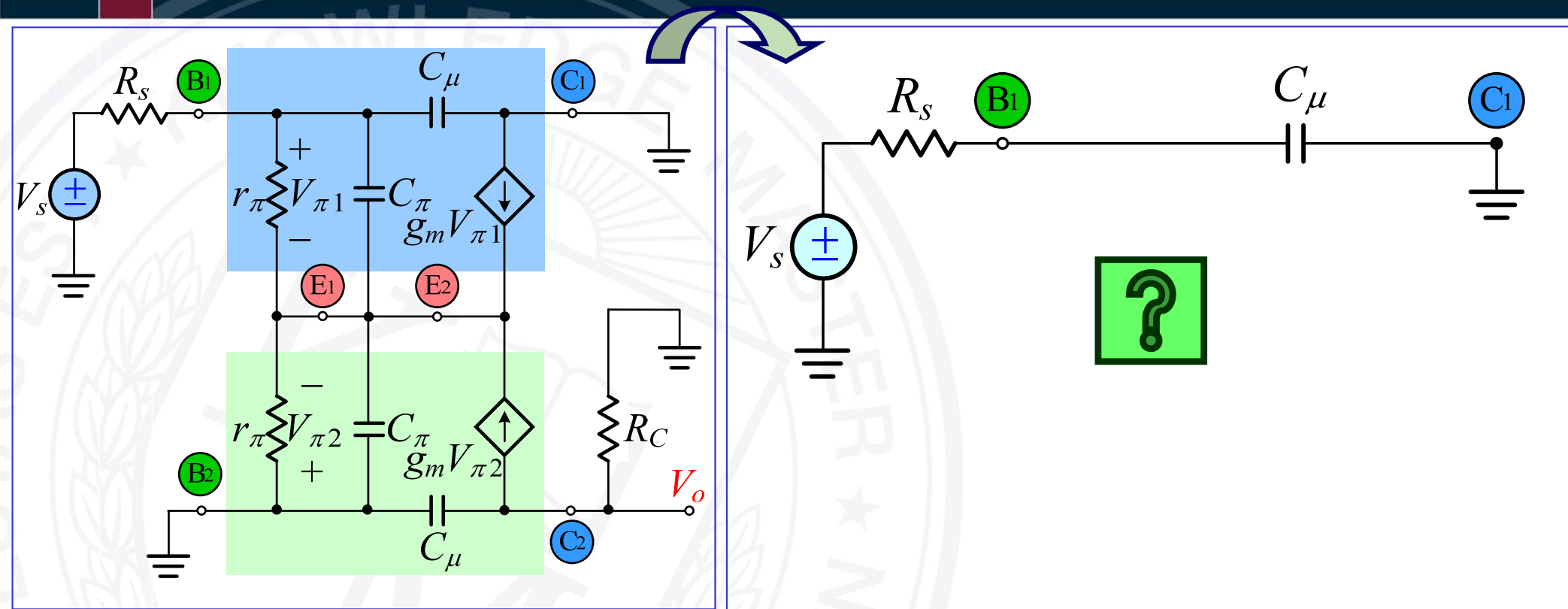
HF Equivalent Circuit



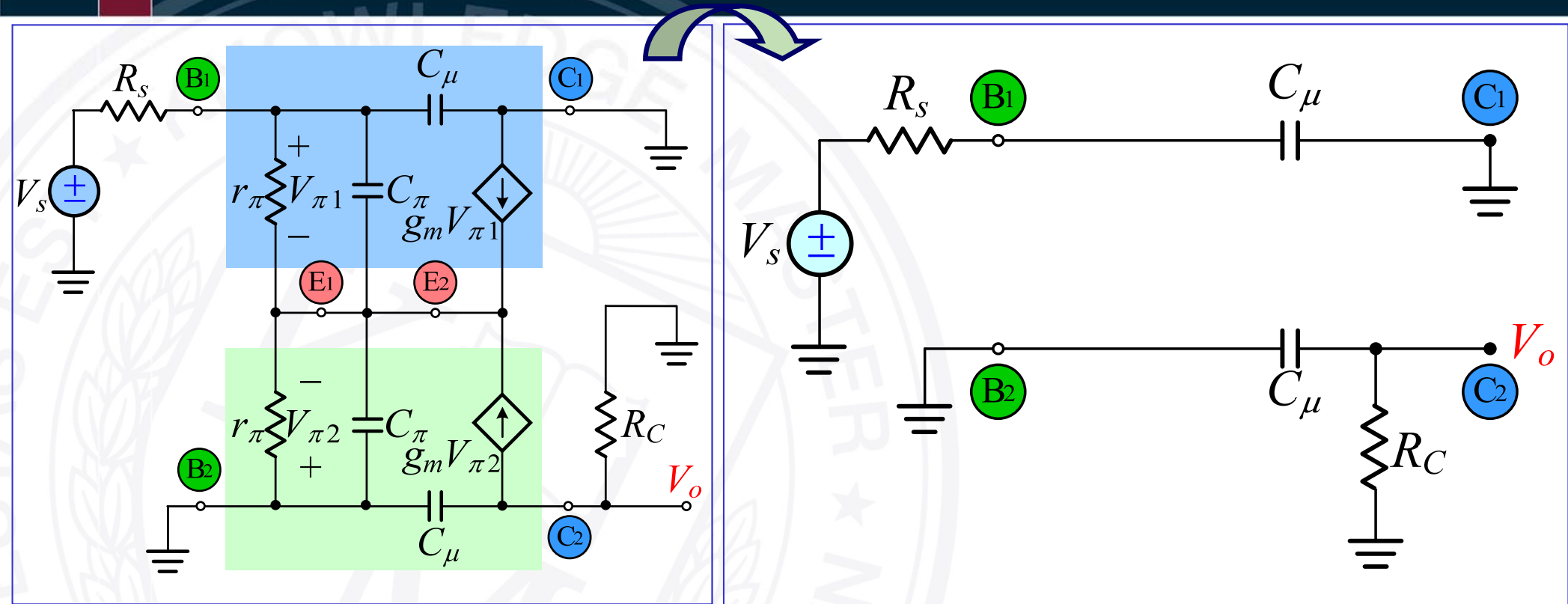
HF Equivalent Circuit



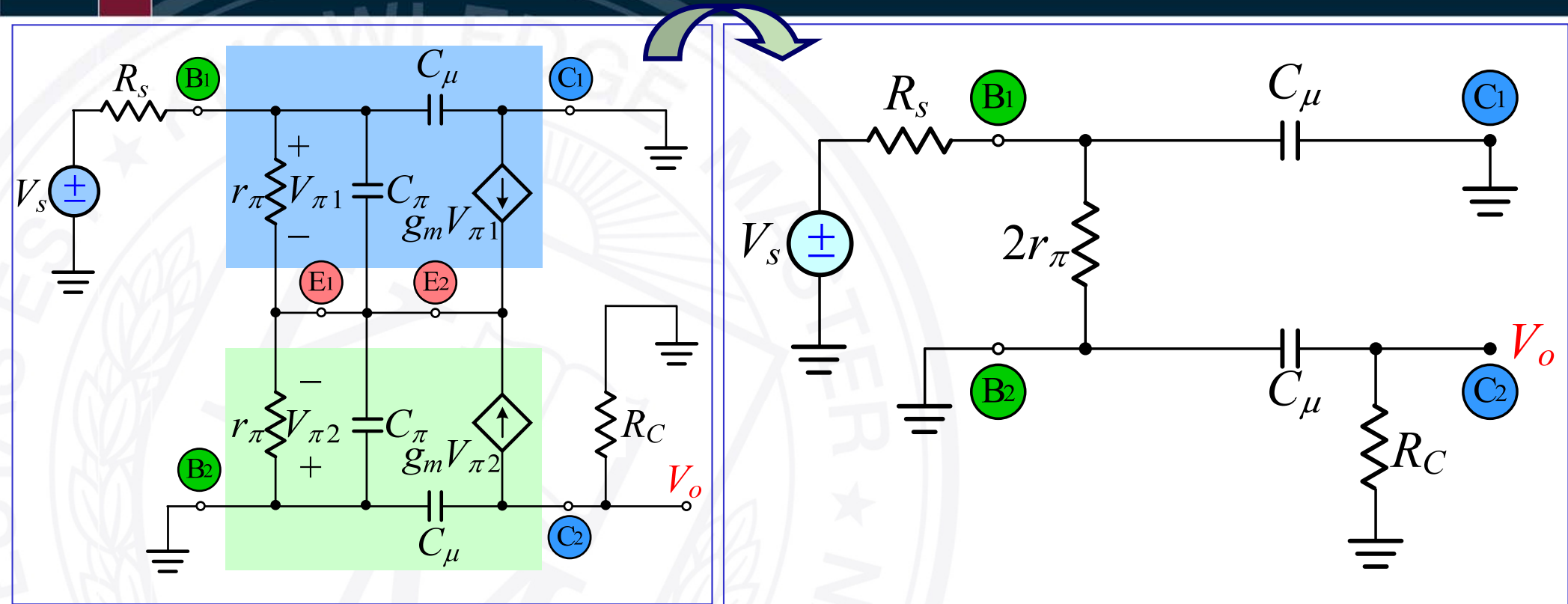
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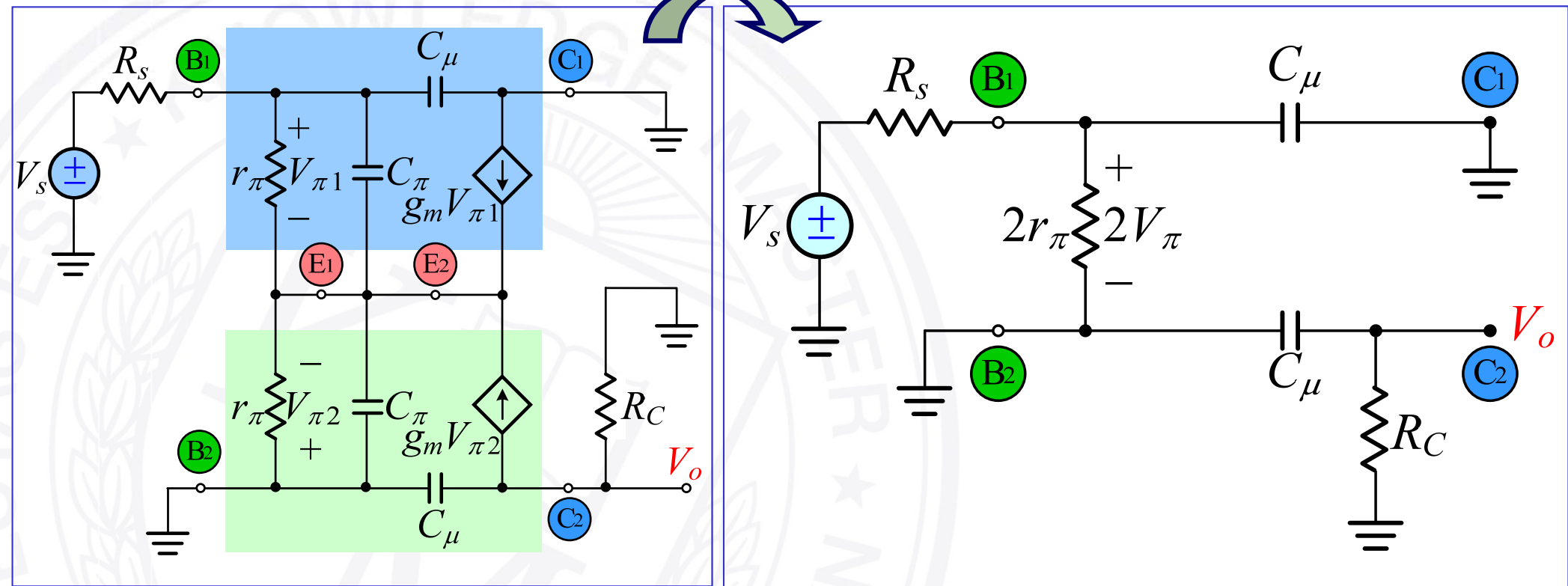
HF Equivalent Circuit



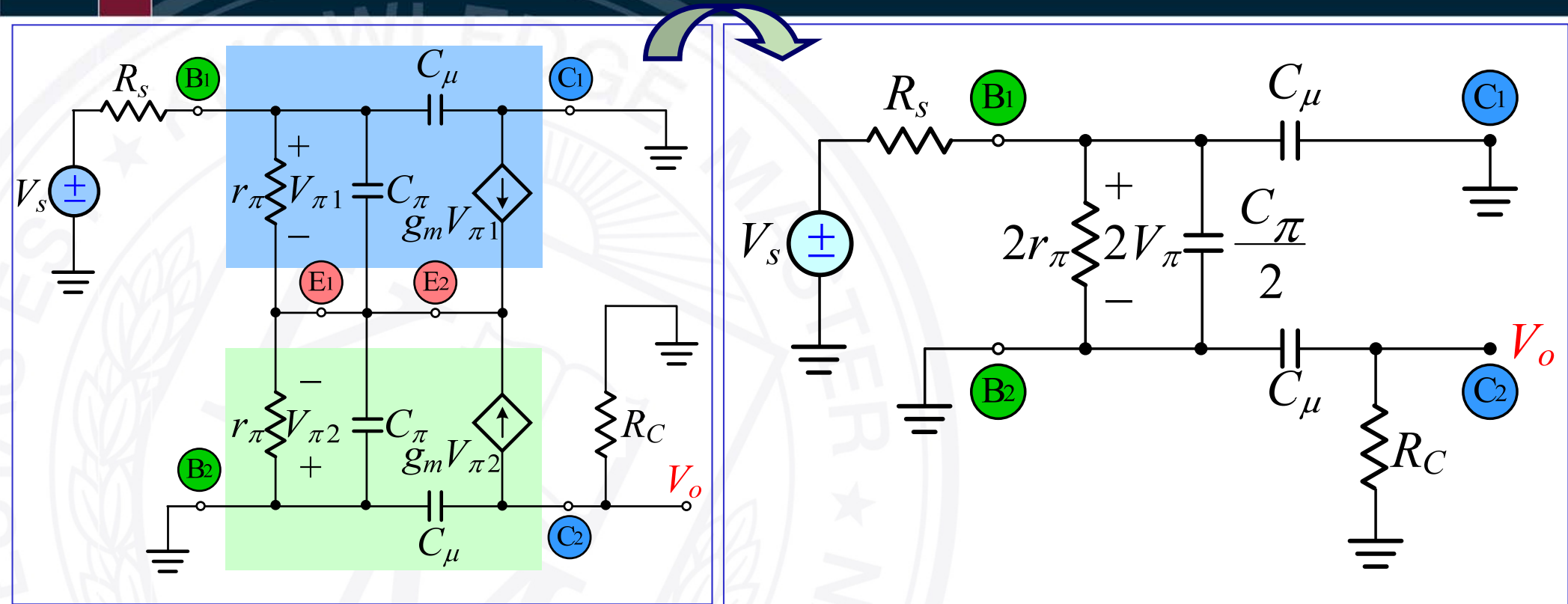
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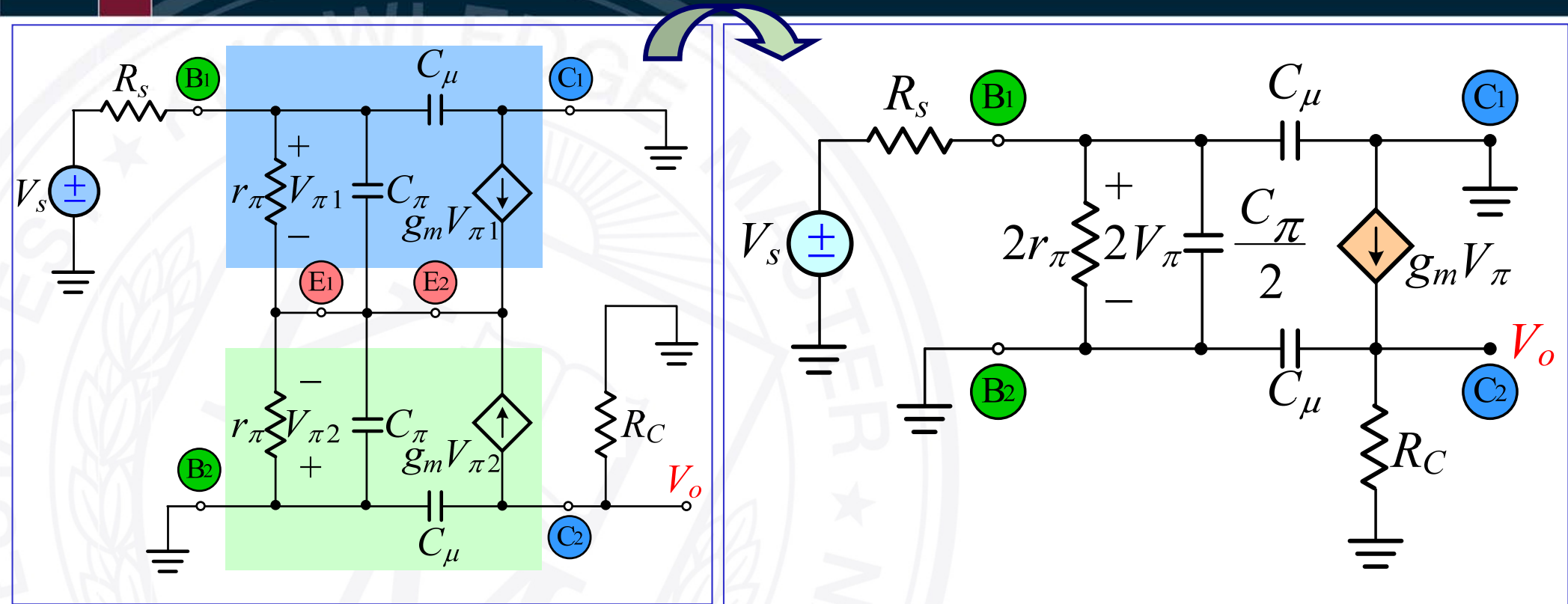
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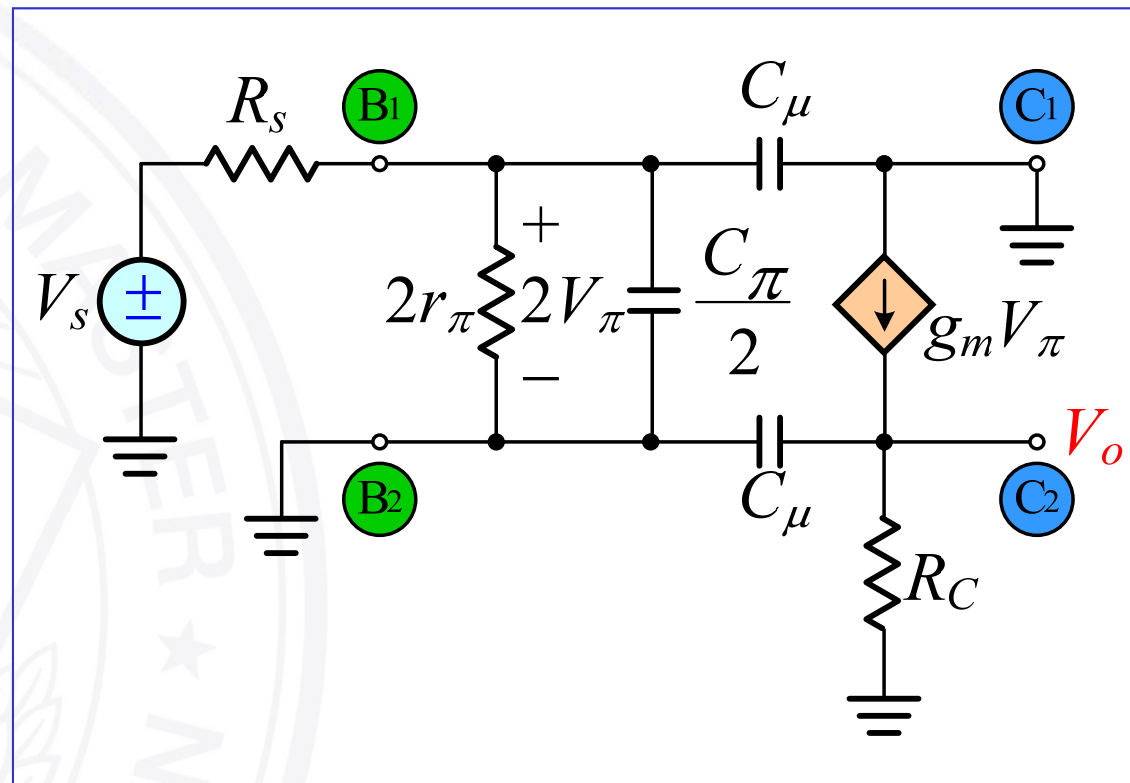
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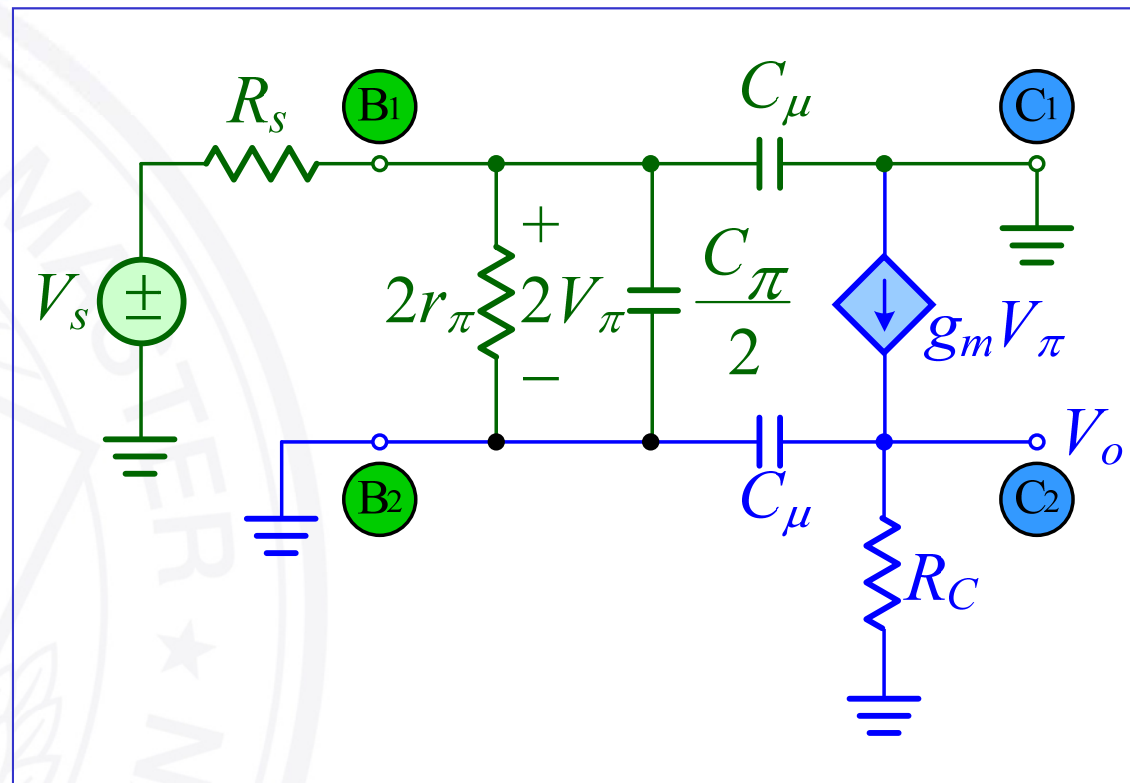
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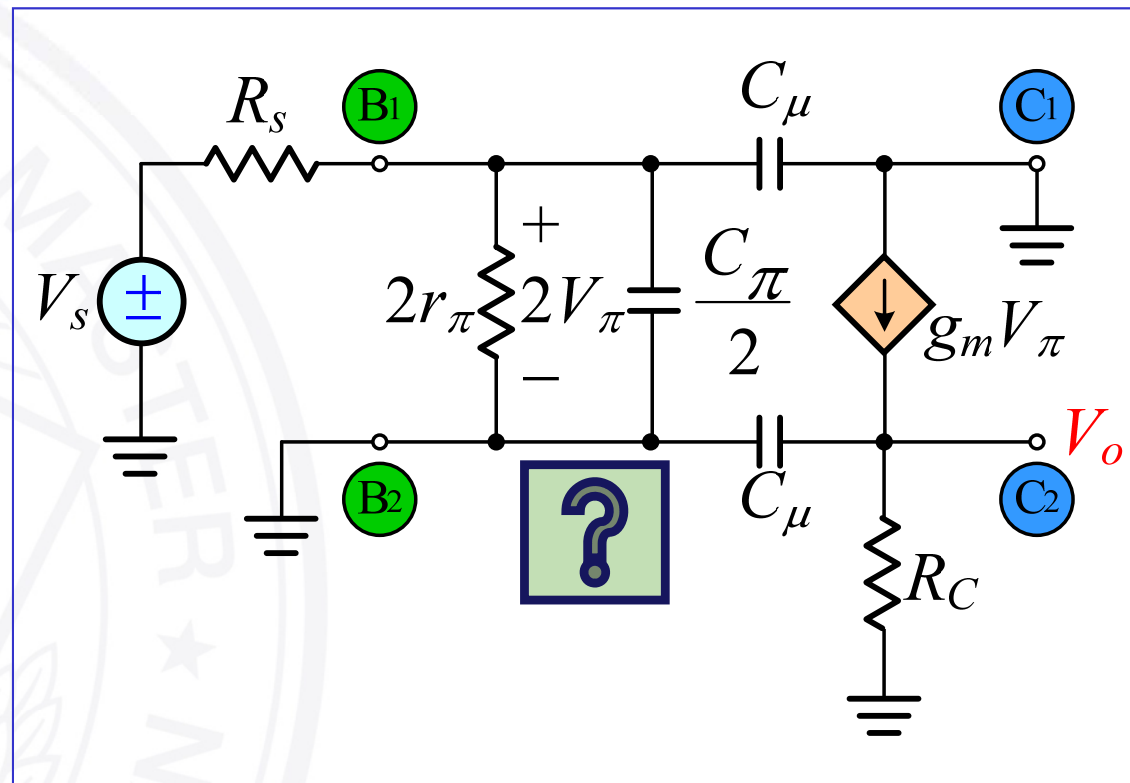
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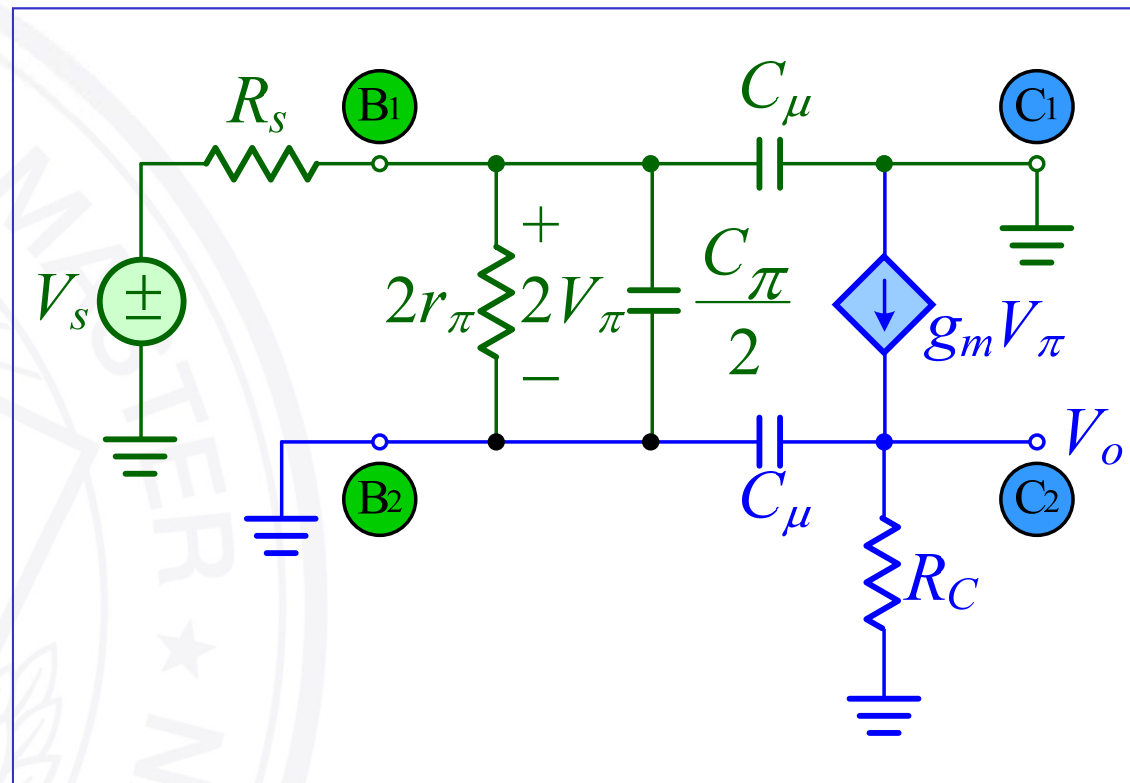
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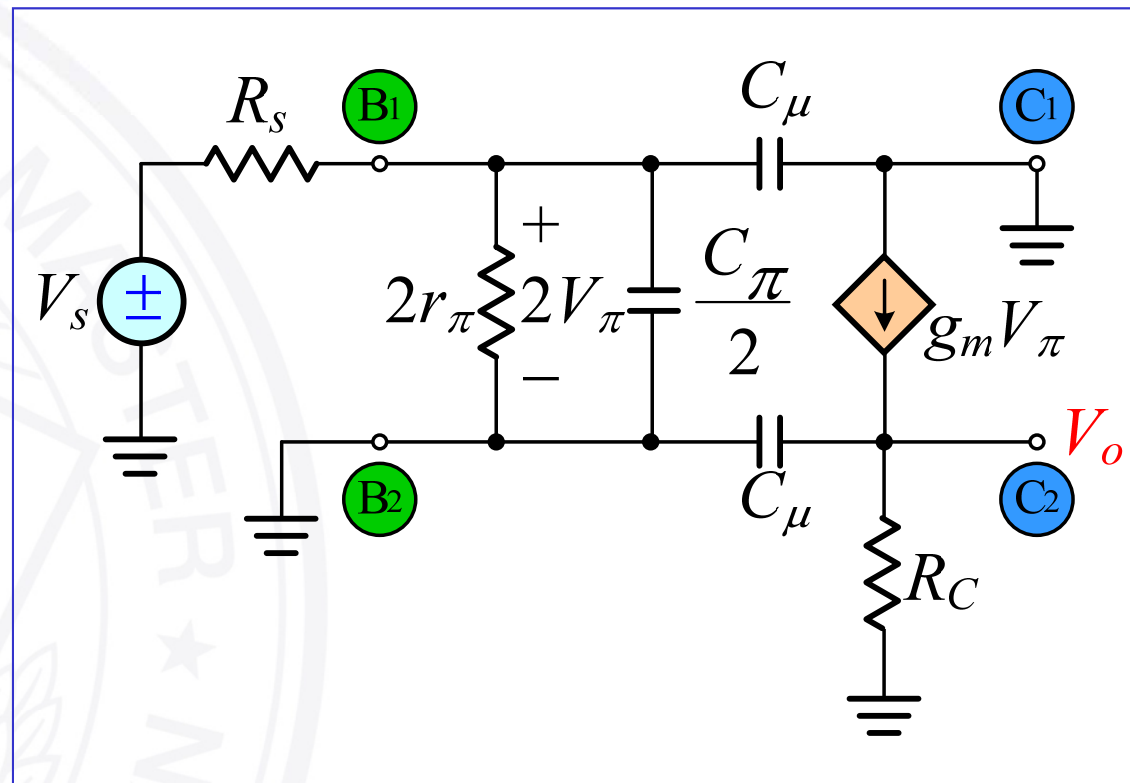
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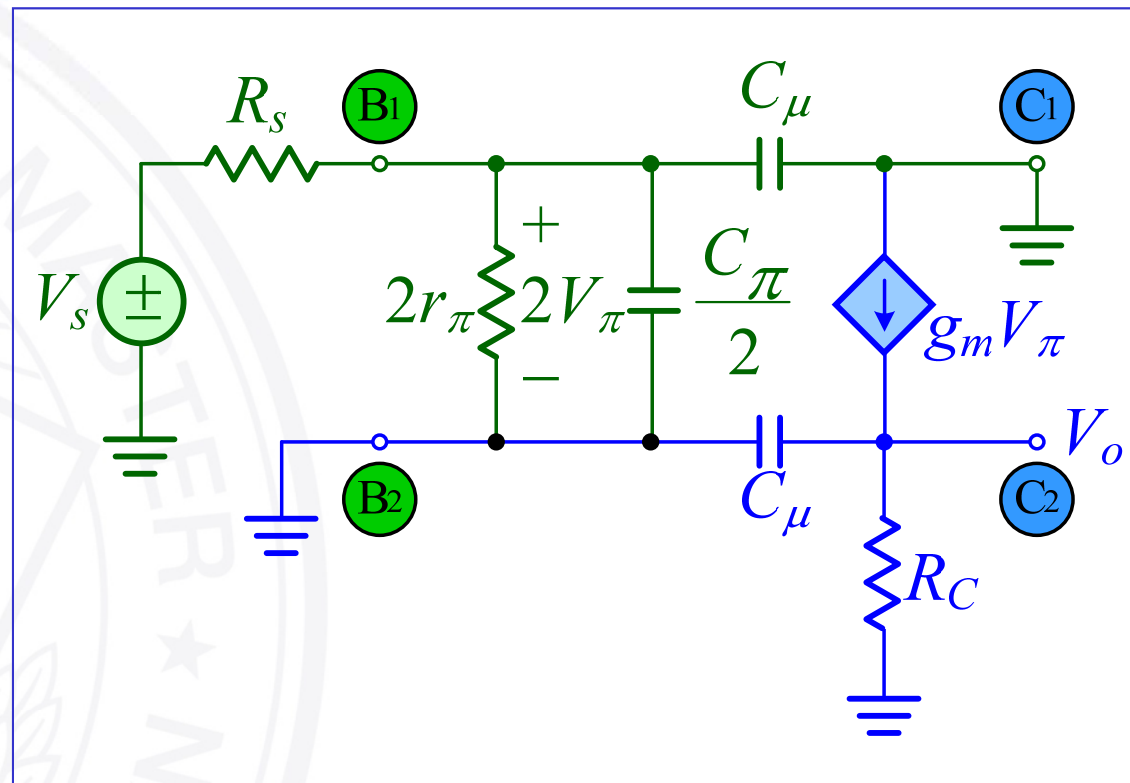
HF Equivalent Circuit



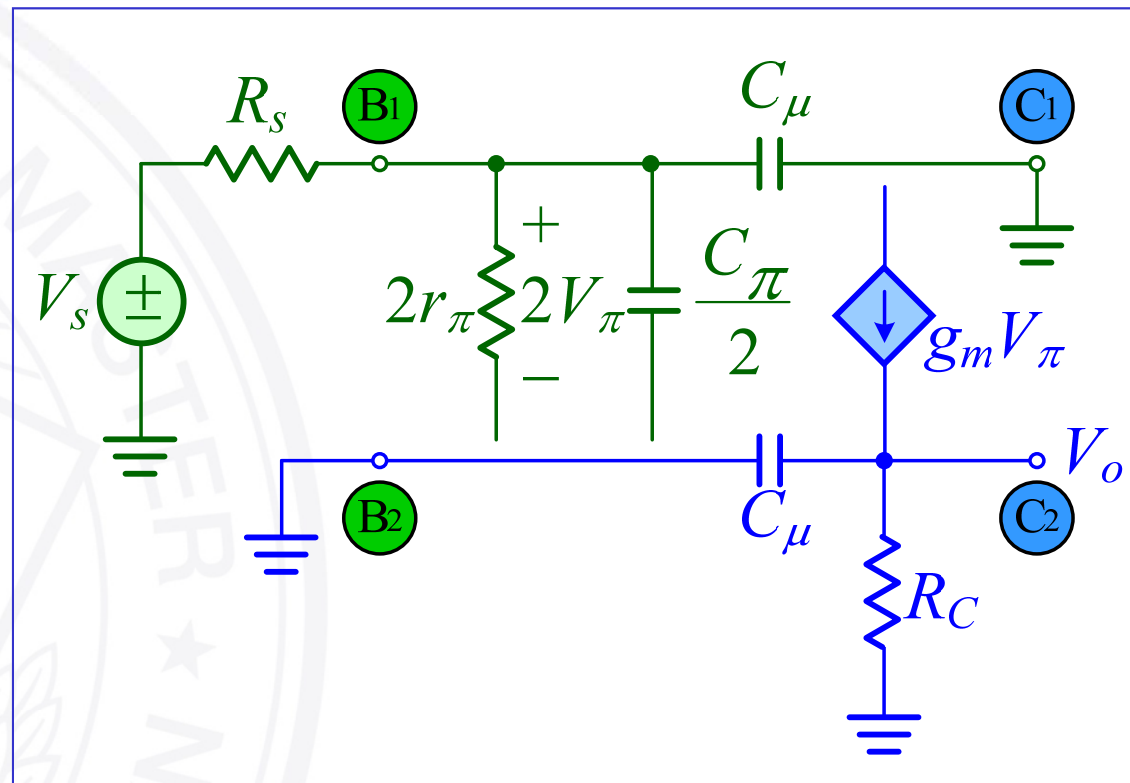
HF Equivalent Circuit



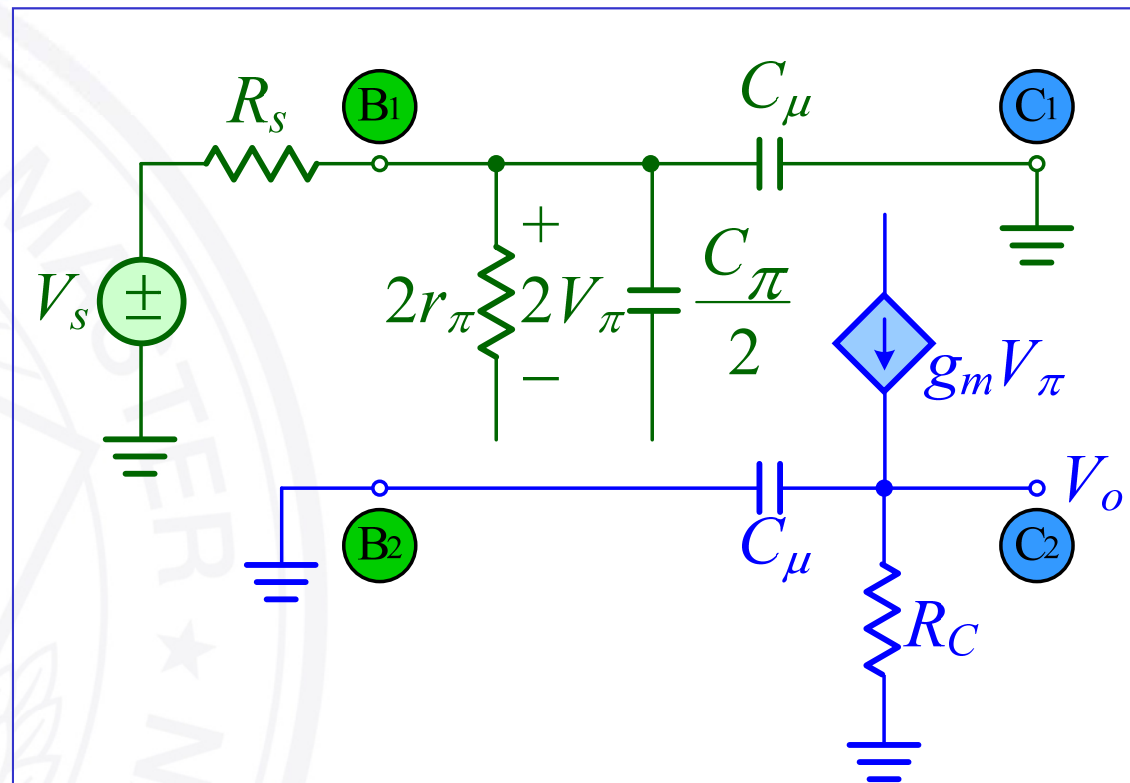
HF Equivalent Circuit



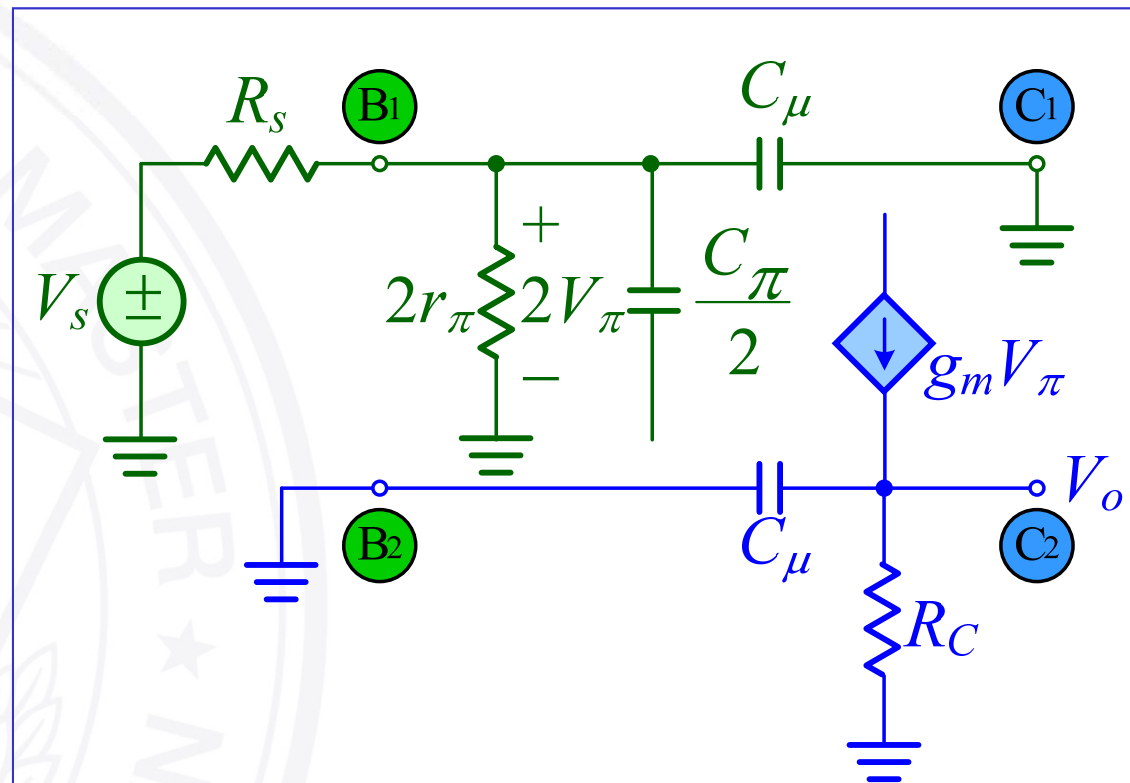
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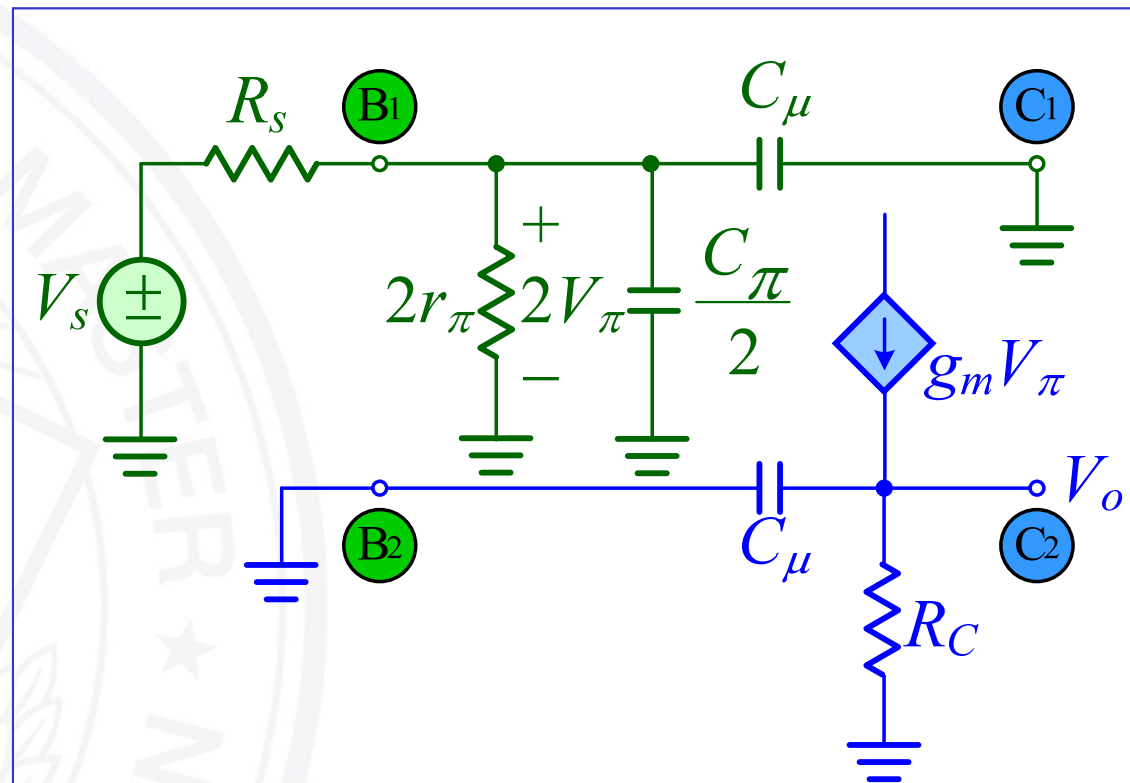
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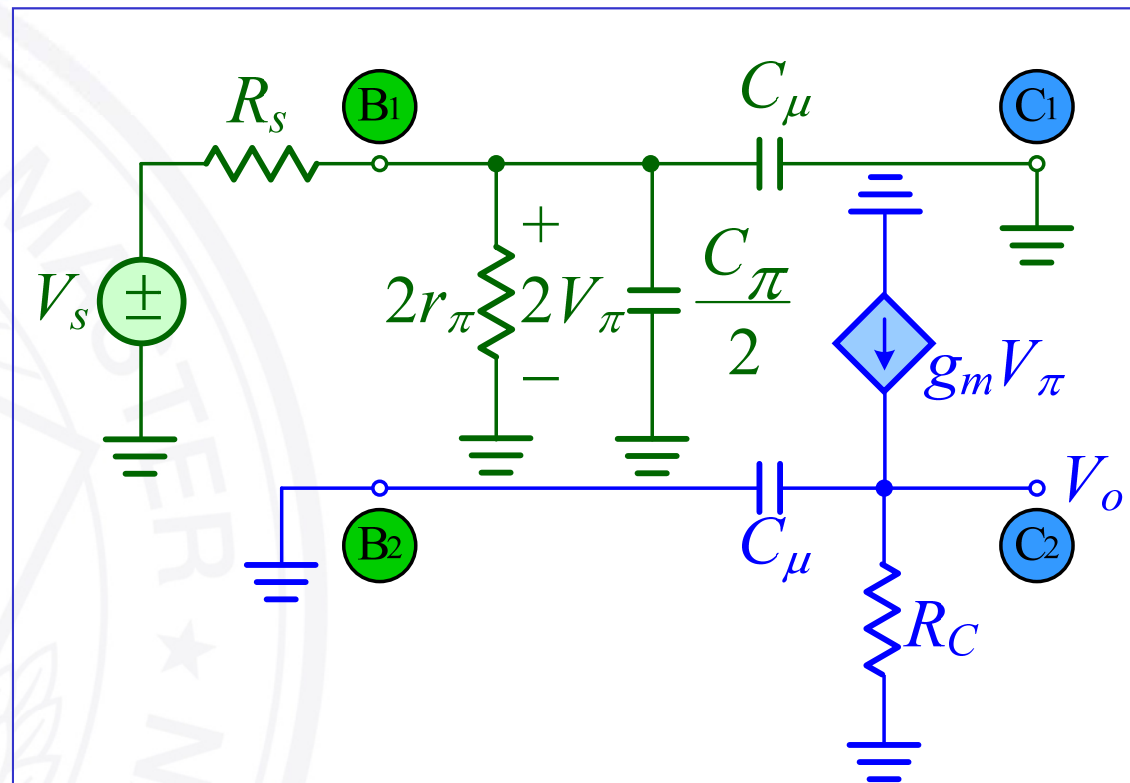
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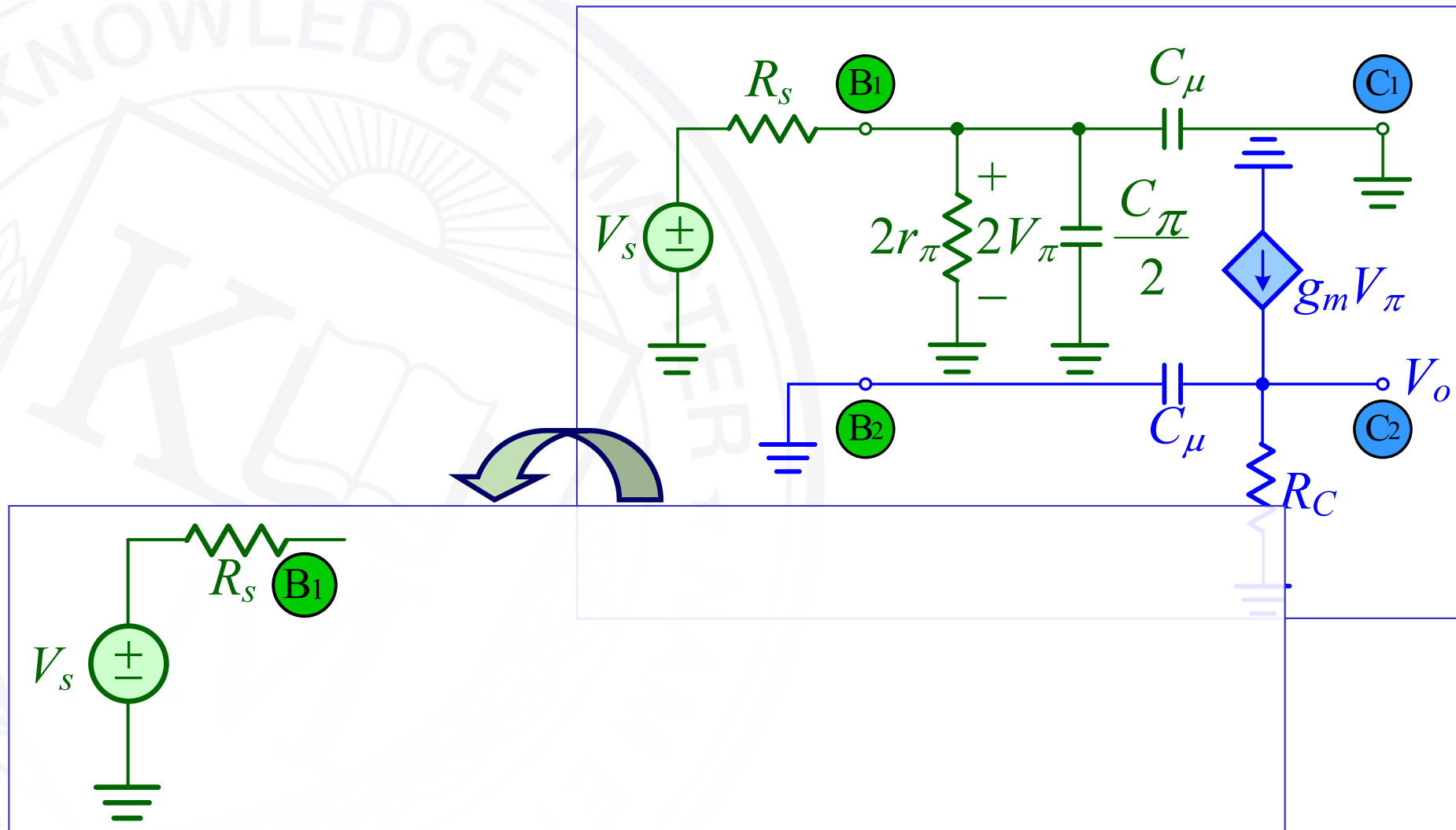
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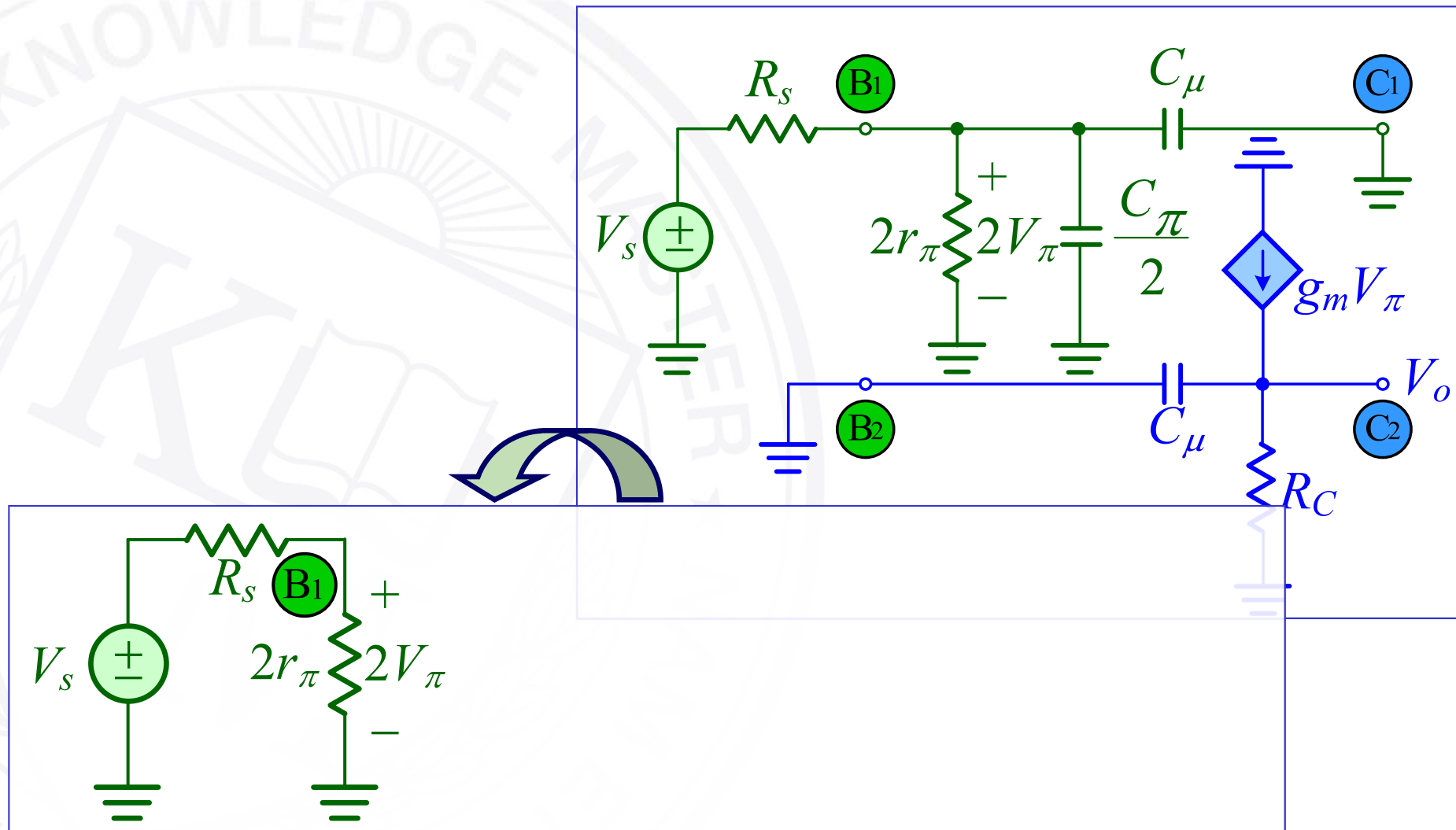
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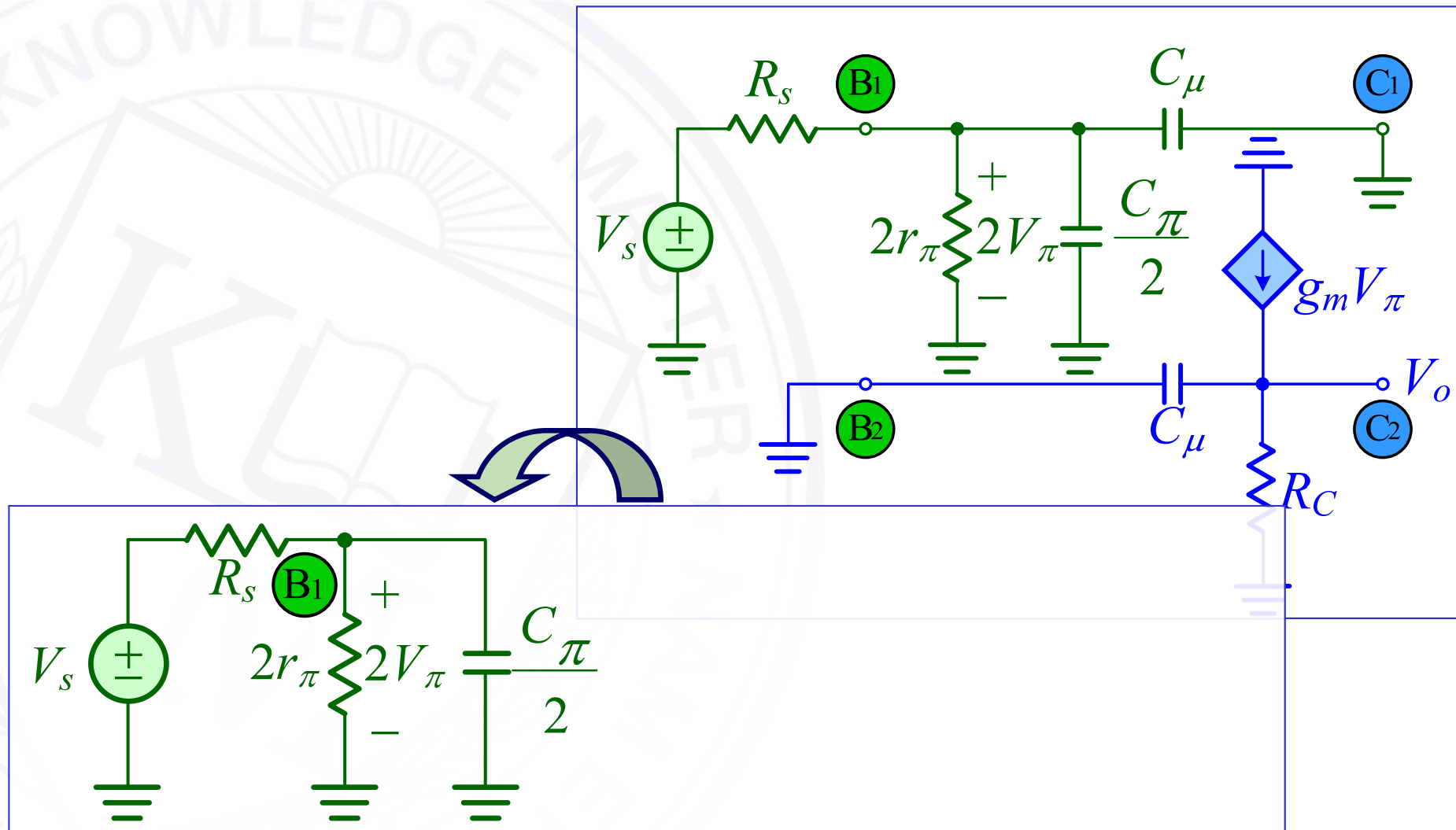
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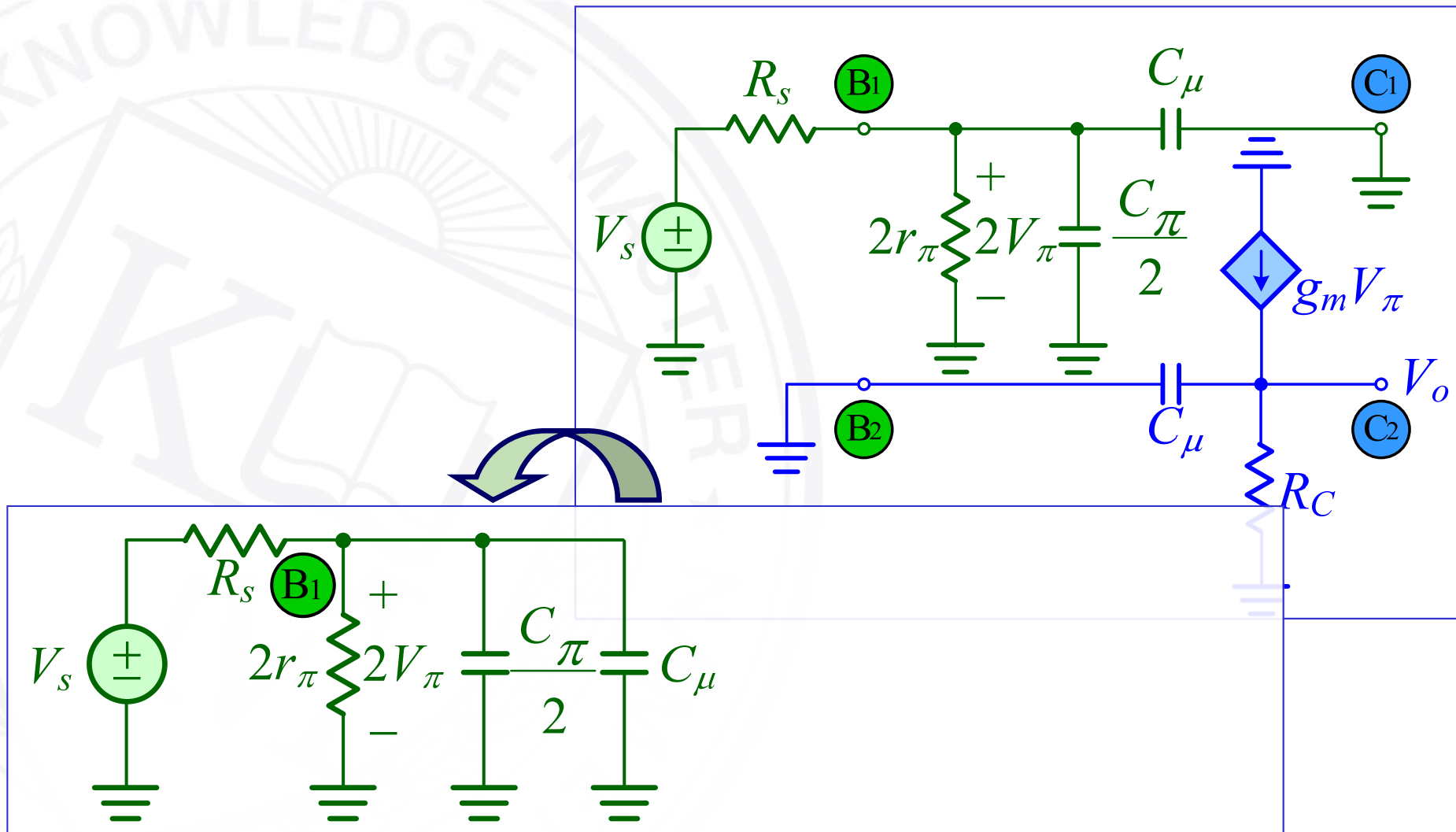
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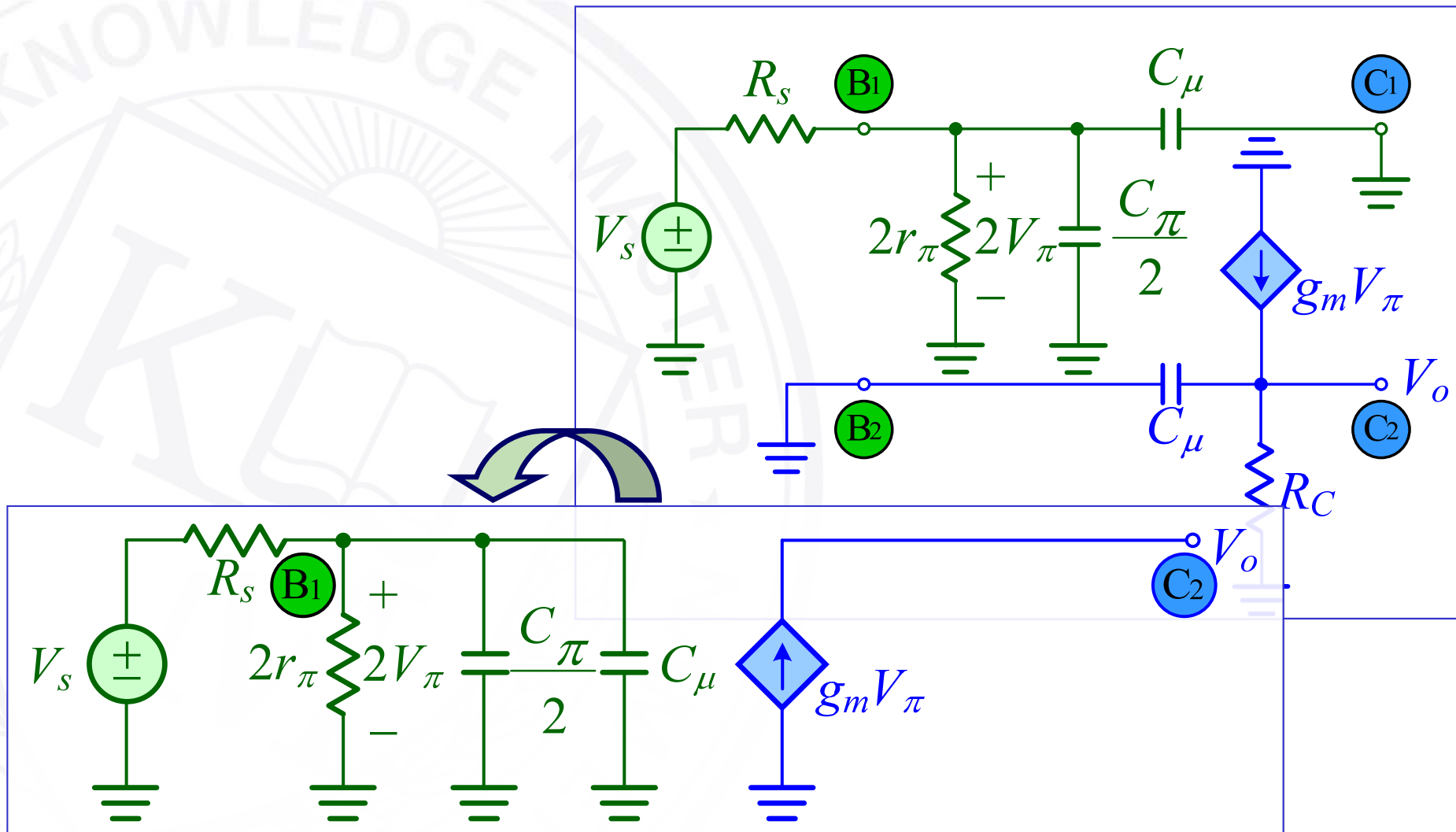
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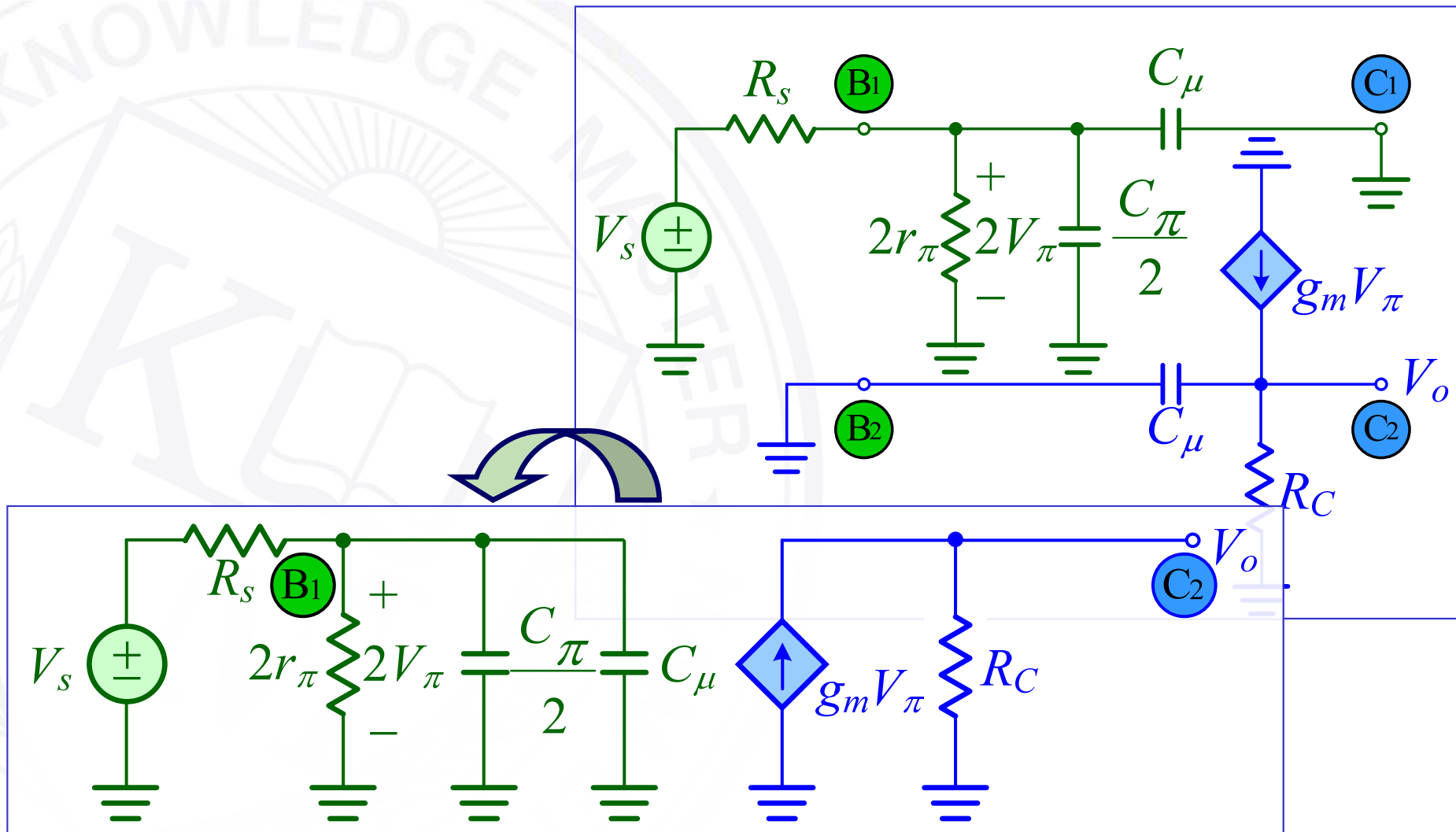
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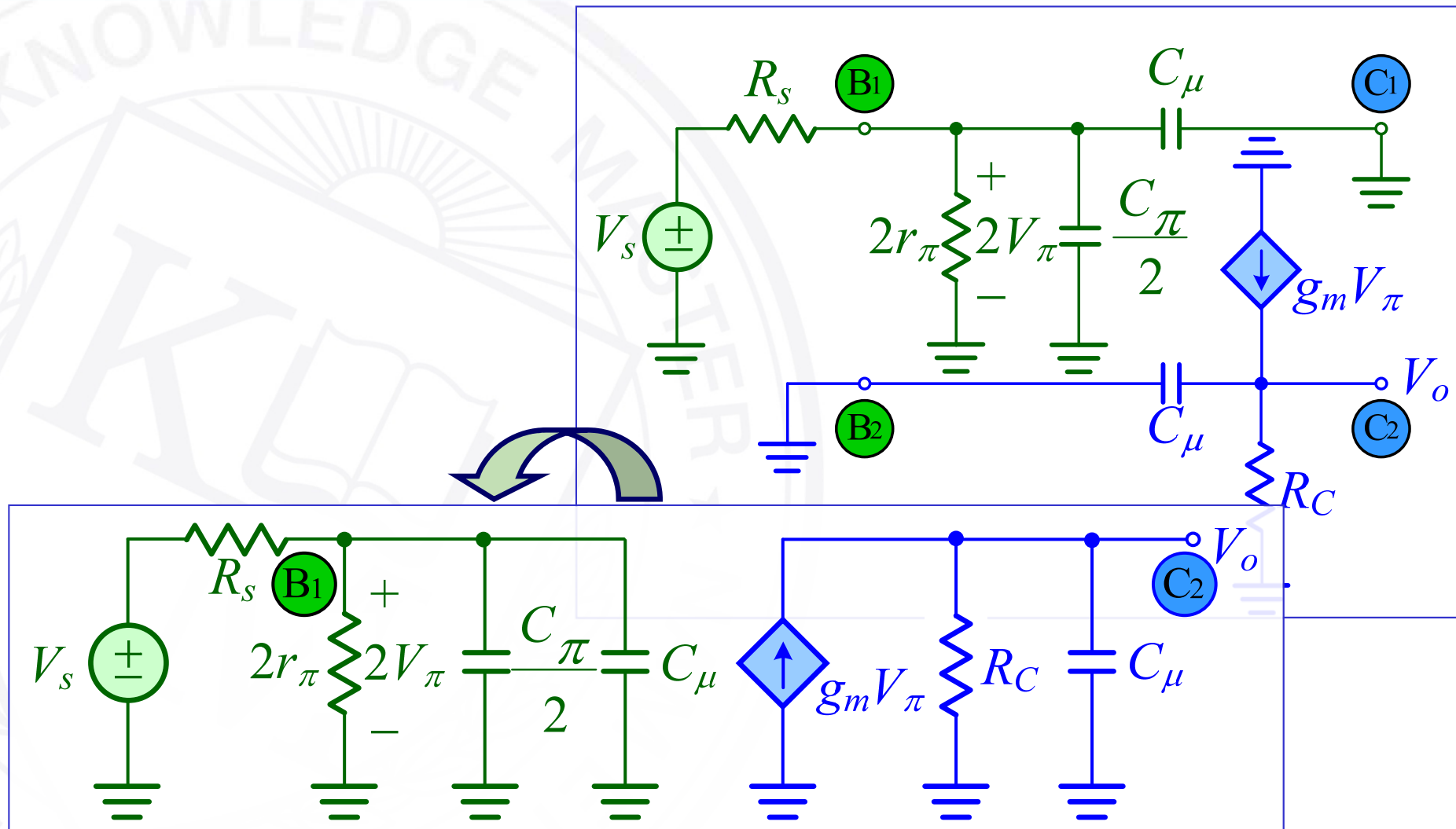
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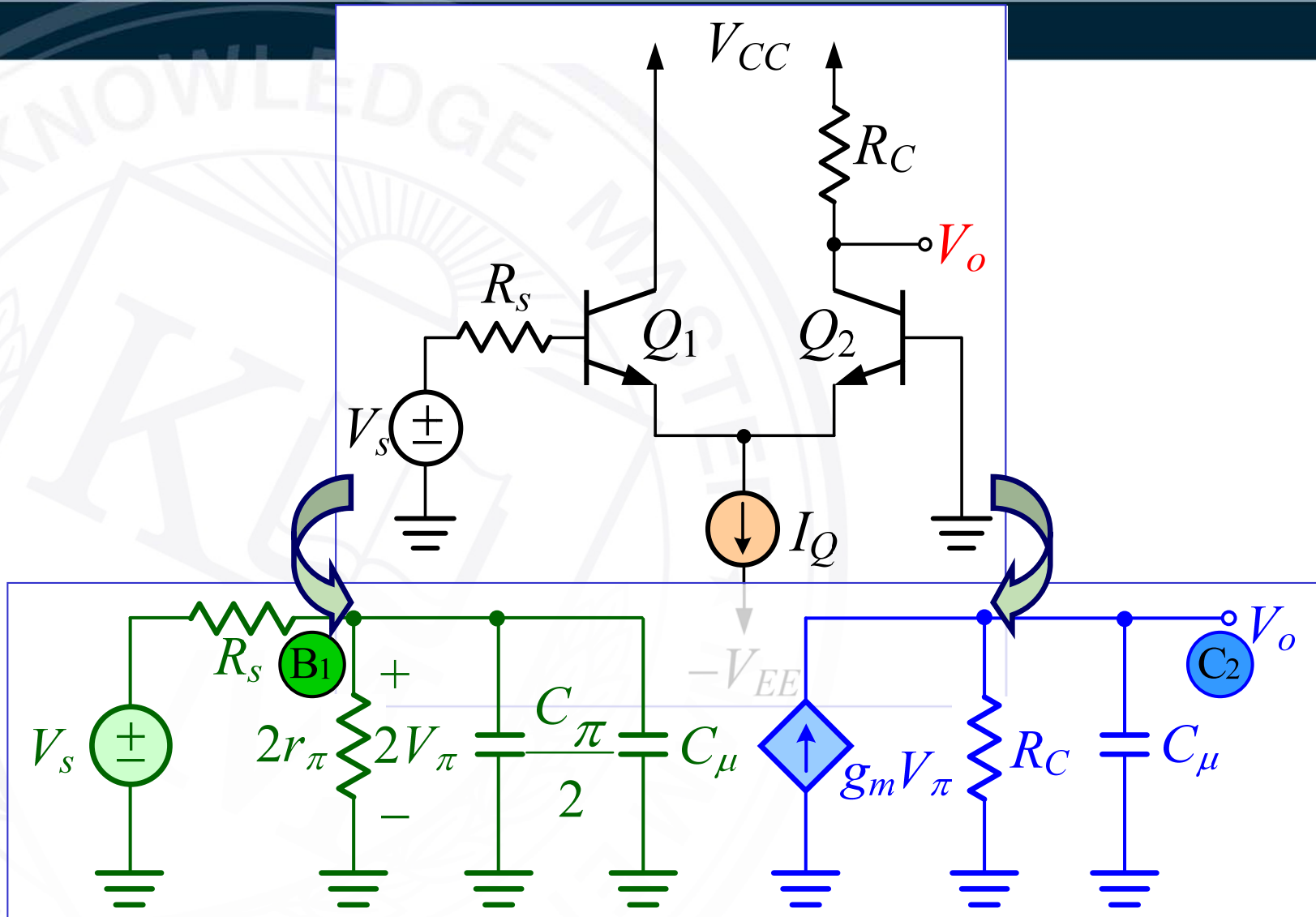
HF Equivalent Circuit



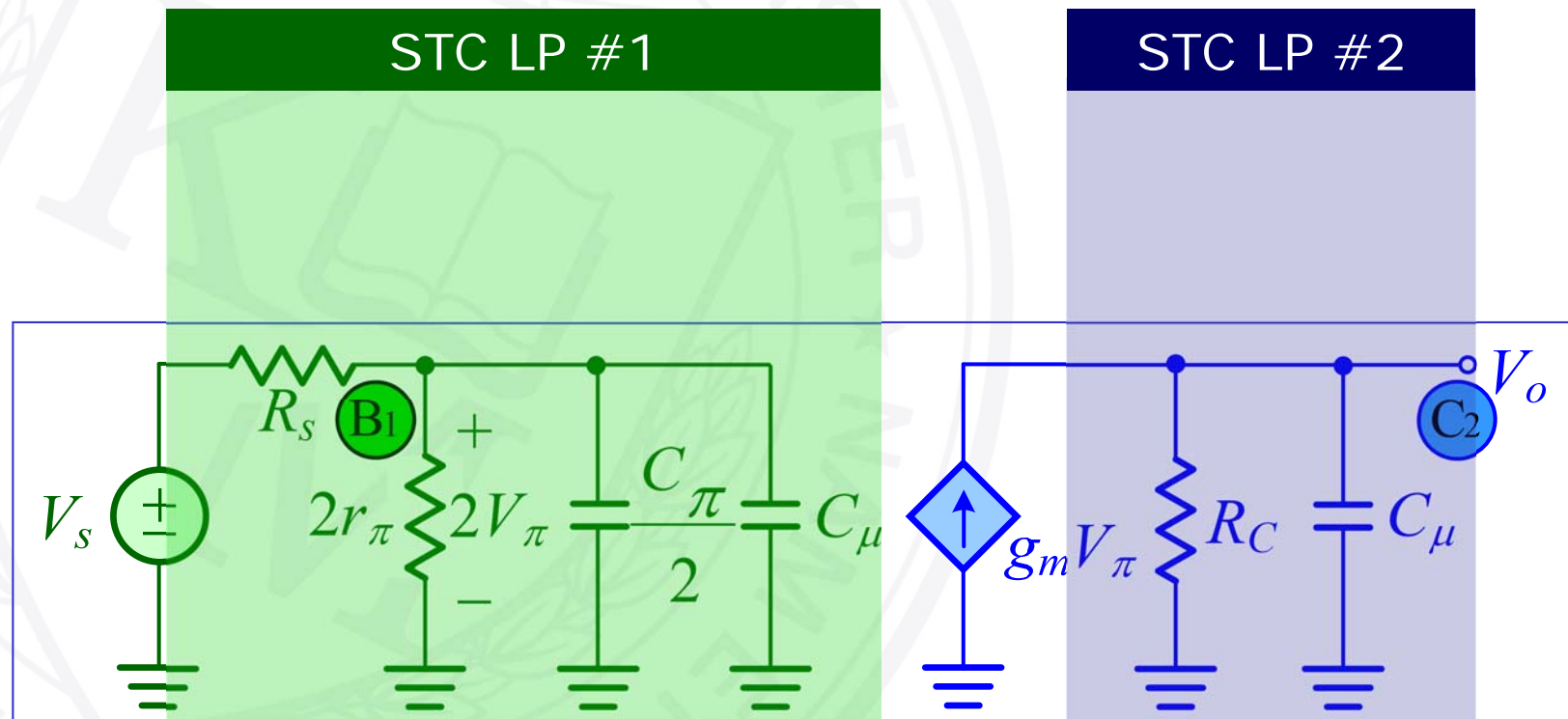
HF Equivalent Circuit



Single Time-Constant Networks

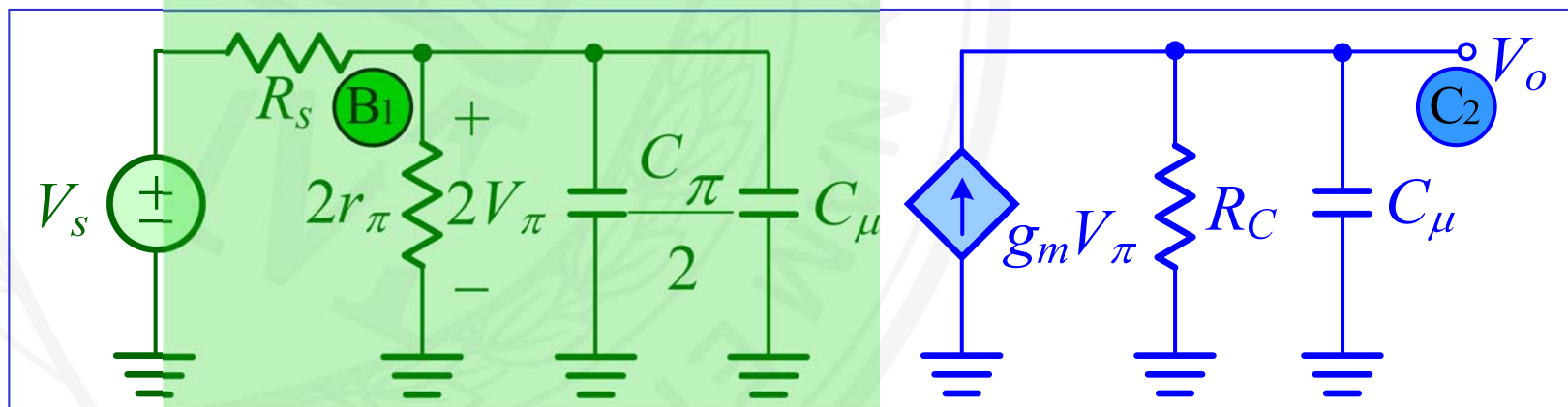


Single Time-Constant Networks



Pole #1

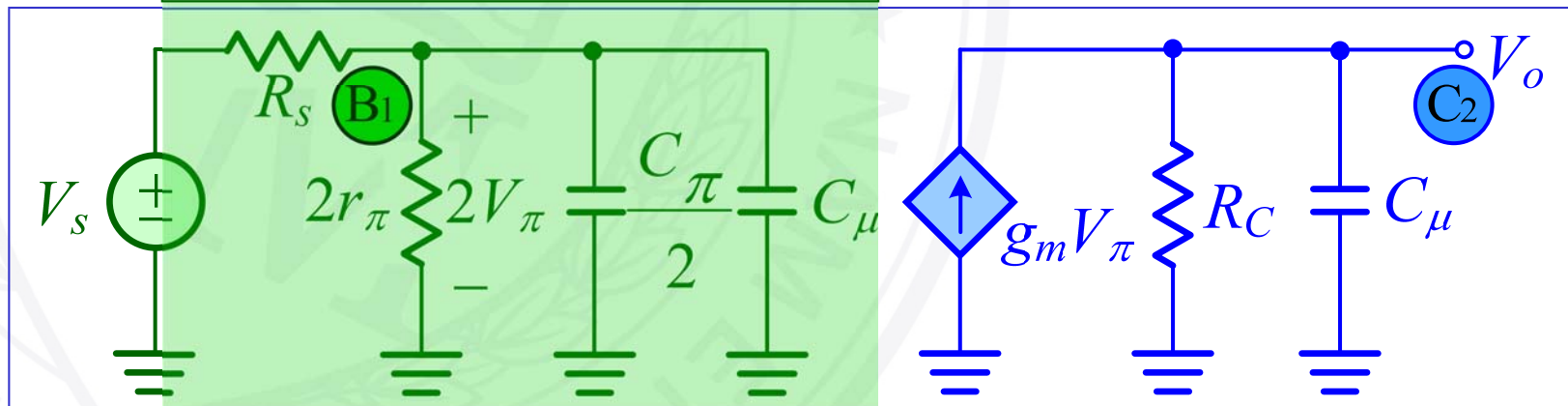
STC LP #1



Pole #1

STC LP #1

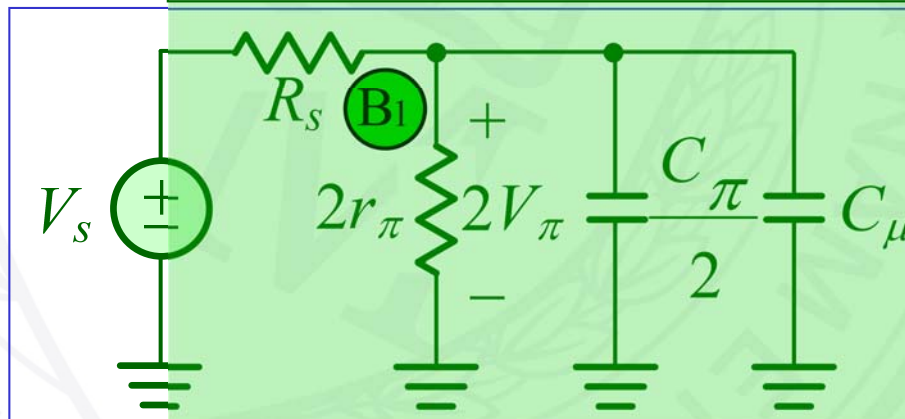
$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$



Pole #2

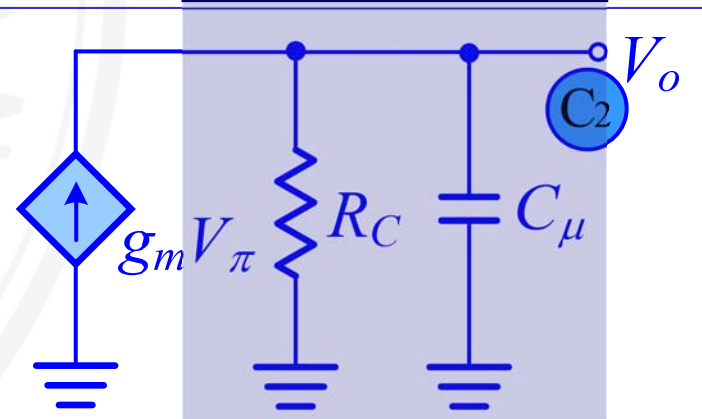
STC LP #1

$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$



STC LP #2

$$\omega_{HP2} = \frac{1}{R_C C_\mu}$$



HF Transfer Function

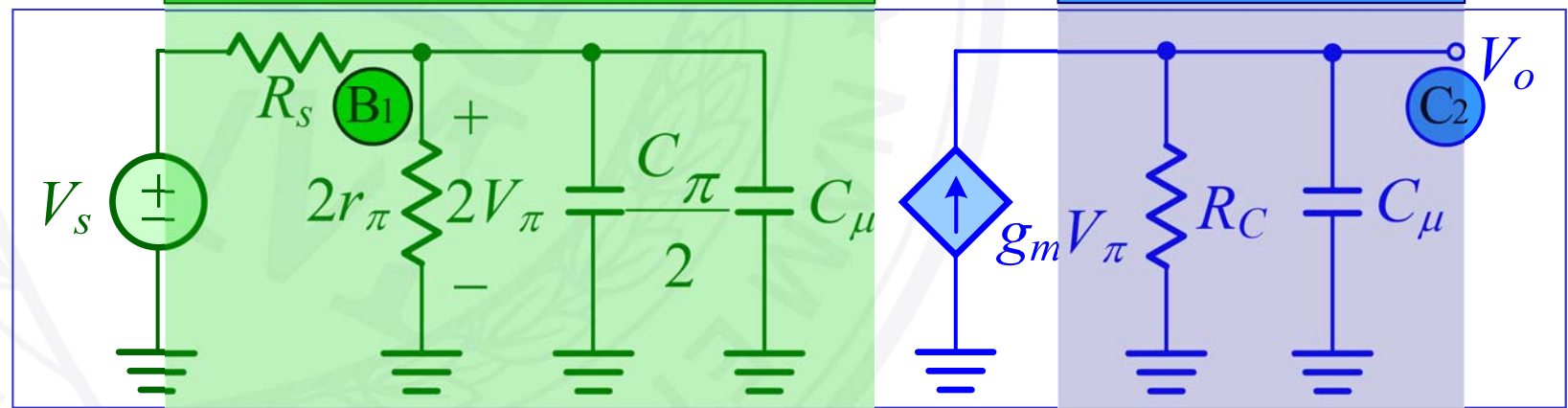
$$A_{VH}(s) = \frac{A_M}{\boxed{?}}$$

STC LP #1

$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$

STC LP #2

$$\omega_{HP2} = \frac{1}{R_C C_\mu}$$



HF Transfer Function

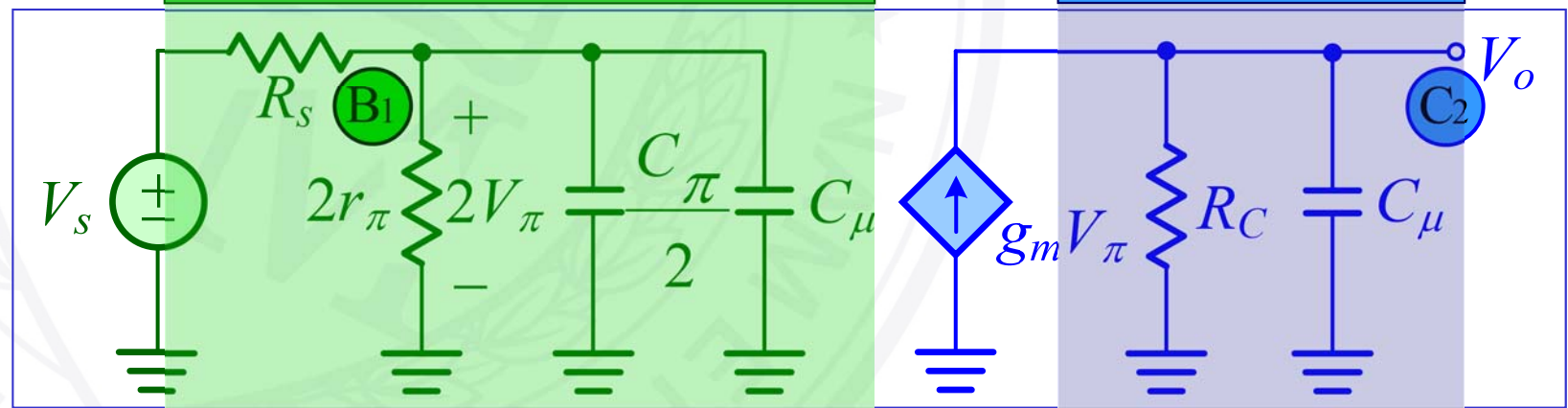
$$A_{VH}(s) = \frac{A_M}{\left(1 + \frac{s}{\omega_{HP1}}\right) \left(1 + \frac{s}{\omega_{HP2}}\right)}$$

STC LP #1

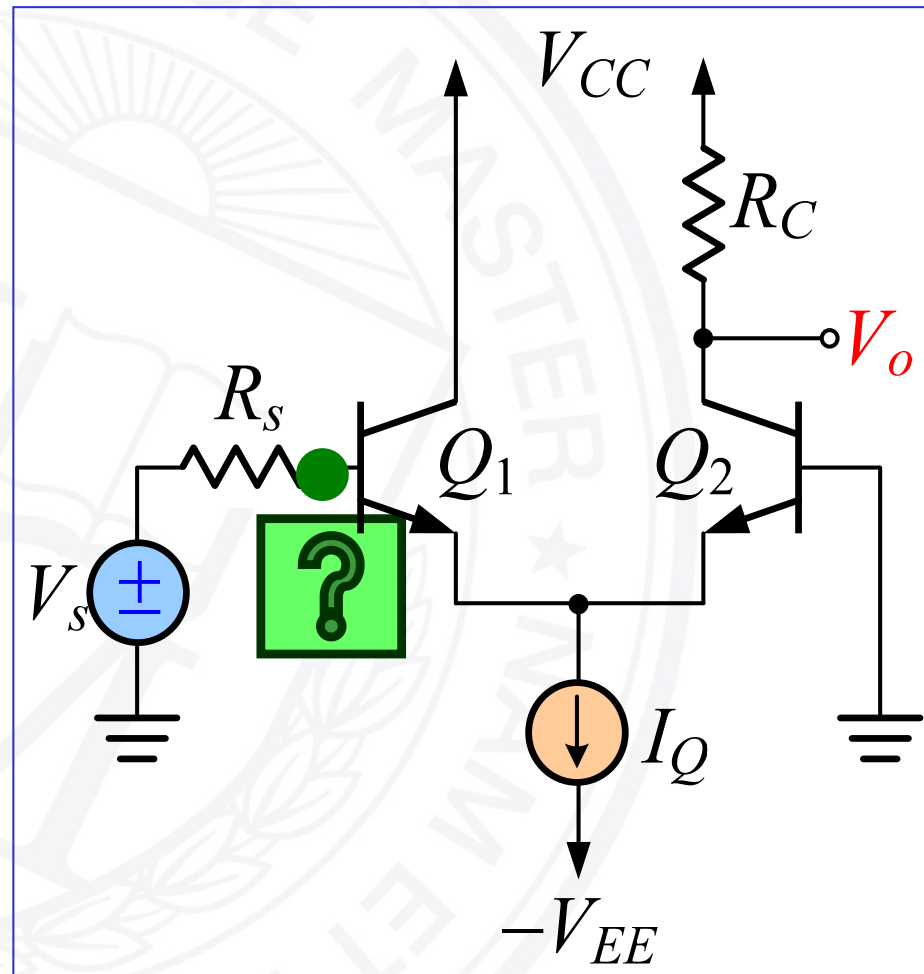
$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$

STC LP #2

$$\omega_{HP2} = \frac{1}{R_C C_\mu}$$

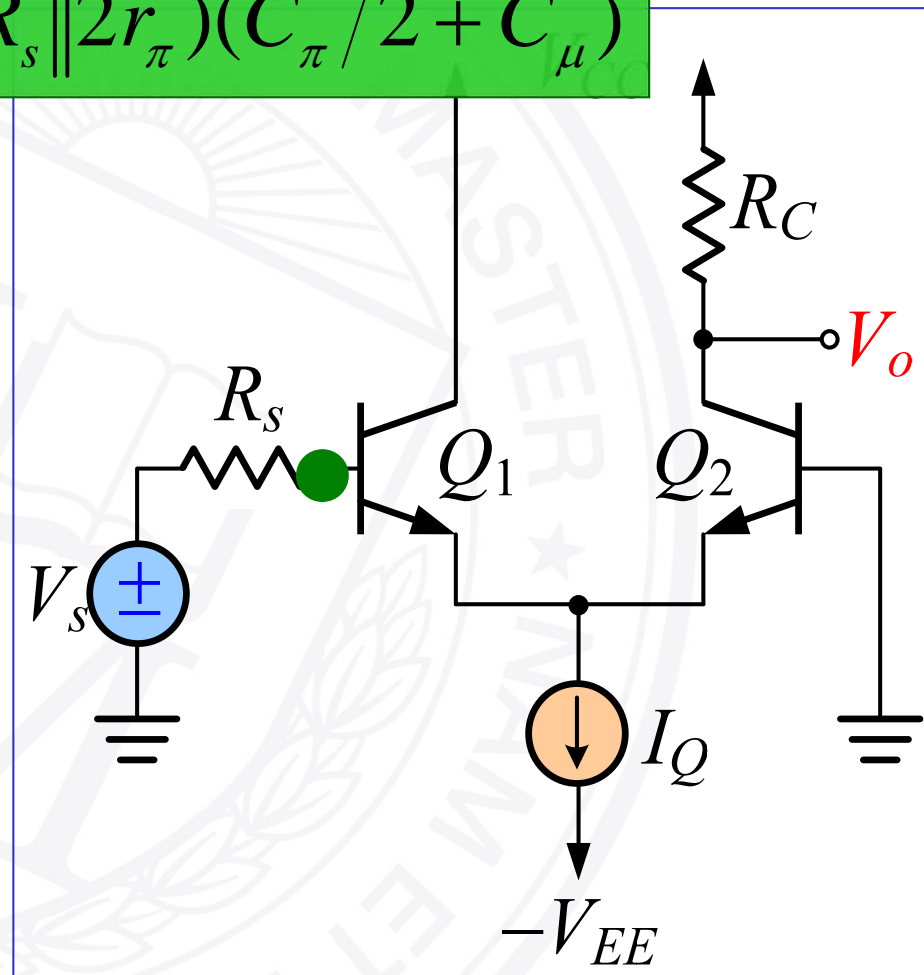


Summary—Analysis by Inspection



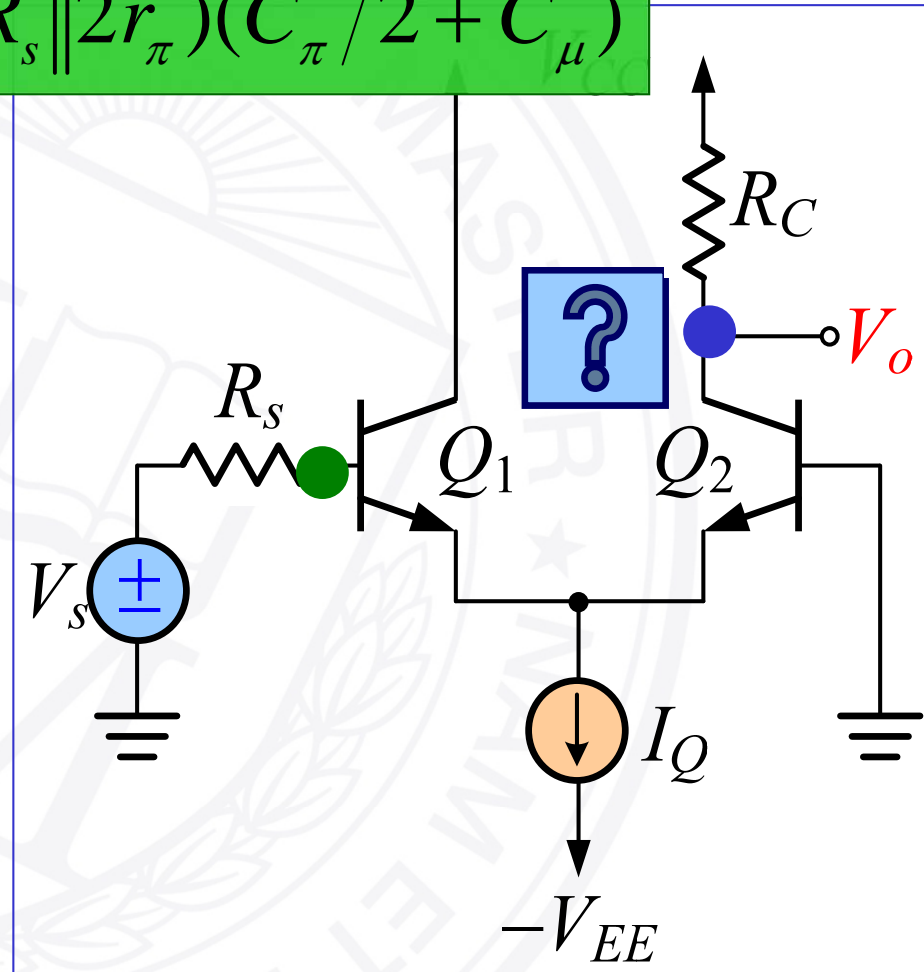
Summary—Analysis by Inspection

$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$



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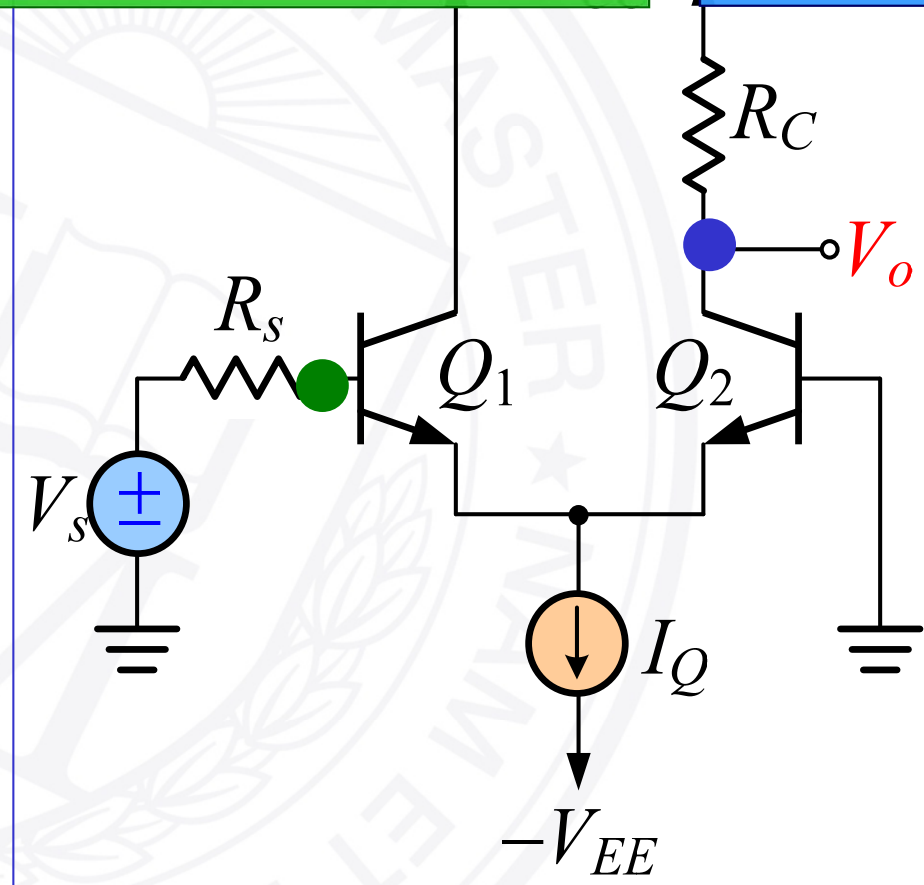
$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$



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$$\omega_{HP1} = \frac{1}{(R_s \parallel 2r_\pi)(C_\pi/2 + C_\mu)}$$

$$\omega_{HP2} = \frac{1}{R_C C_\mu}$$



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