Electronics II

Lecture 06
BJT Small Signal Analysis

Muhammad Tilal
Department of Electrical Engineering
CIIT Attock Campus

Previous Lecture

- re Equivalent Model
  - Common Emitter Configuration.
  - Common Collector Configuration.

- BJT Small Signal Analysis
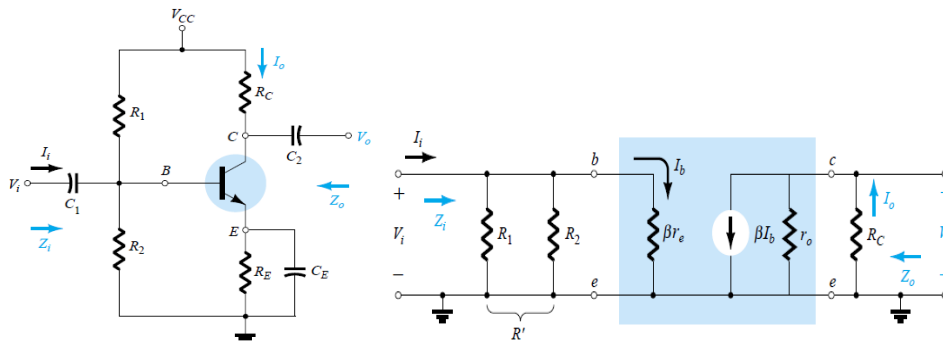 - CE Fixed Bias Configuration.

Session Overview

Topic	BJT Small Signal Analysis
Concepts	Small Signal Analysis of CE Voltage Divider Bias Configuration and CE Emitter Bias Configuration.
Recommended Reading	Sections 8.3 & 8.4 of [1]
Keywords	Fixed Bias, Voltage Divider, Emitter Bias.

CE Voltage Divider Bias Configuration

- $R' = R_1 || R_2 = (R_1 R_2)/ (R_1 + R_2)$
- $Z_i = R' || \beta r_e$

- $Z_o = R_c || r_o$
  $Z_o \cong R_c$
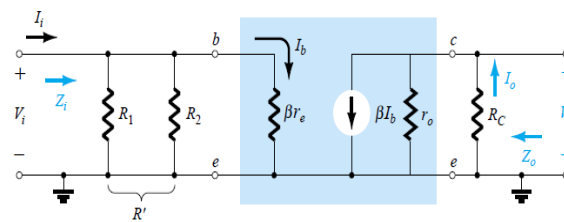

Robert L. Boylestad, *Electronic Devices and Circuit Theory,* 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.

CE Voltage Divider Bias Configuration

- Voltage Gain, A_v
  $A_v \cong -R_c/r_e$
- Derivation

- Current Gain, A_i
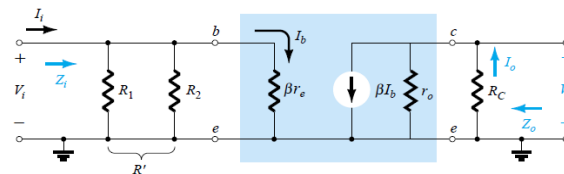 $A_i \cong \beta$
- Derivation

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CE Voltage Divider Bias Configuration

- *Example 8.2 (Boylestad):* For the given network, determine
  - r_e
  - Z_i
  - Z_o (with $r_o = \infty\,\Omega$)
  - A_v (with $r_o = \infty\,\Omega$)
  - A_i (with $r_o = \infty\,\Omega$)
  - Calculate Z_o, A_v & A_i if $r_o = 1/h_{oe} = 50k\Omega$ & compare.
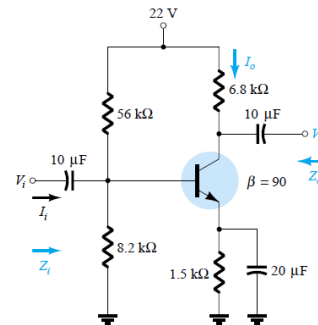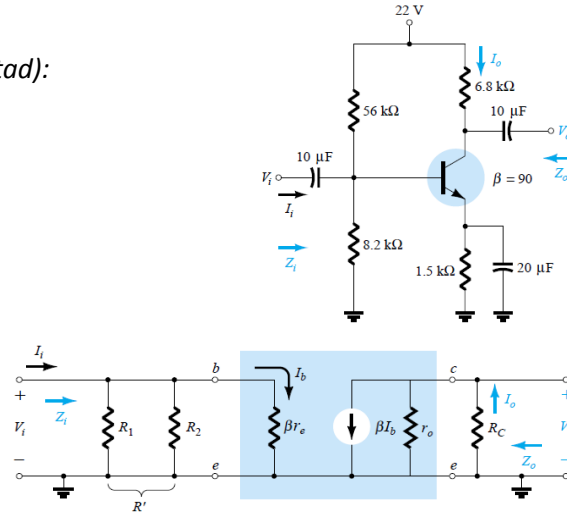

Robert L. Boylestad, *Electronic Devices and Circuit Theory,* 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.
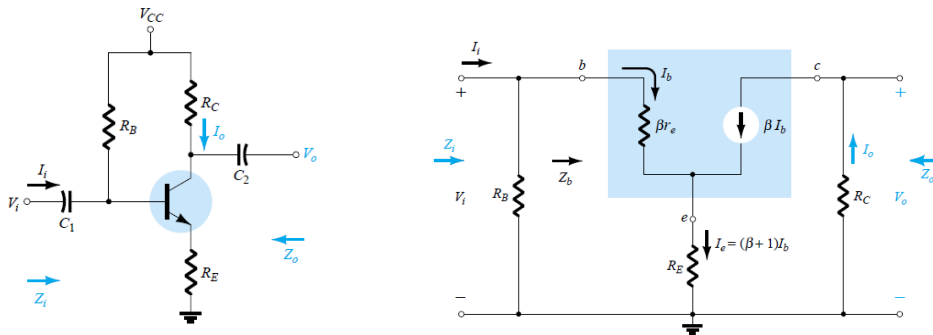
CE Voltage Divider Bias Configuration
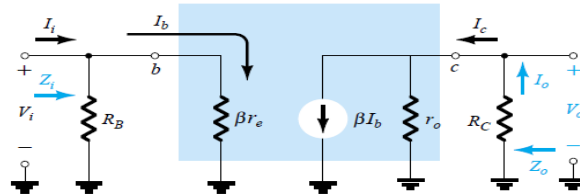
- *Sol.Example 8.2 (Boylestad):*

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CE Emitter Bias Configuration (R$_E$ Unbypassed)

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COMSATS   **Electronics II**

CE Emitter Bias Configuration (R_E Bypassed)

- The small signal analysis of CE Emitter Bias Configuration with emitter resistance bypassed is identical to the analysis of CE Fixed Bias Configuration.
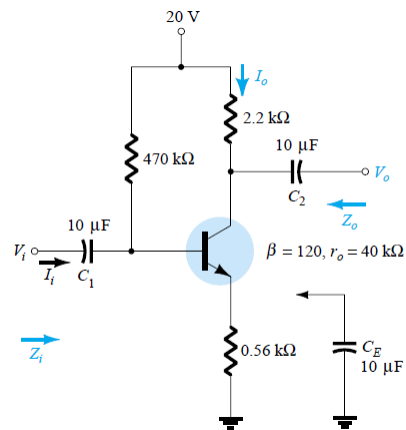

Robert L. Boylestad, *Electronic Devices and Circuit Theory,* 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.

COMSATS   **Electronics II**

CE Emitter Bias Configuration

- *Example 8.3 (Boylestad):* For the given network, calculate r_e, Z_i, Z_o, A_v, A_i for unbypassed Emitter resistance.

Robert L. Boylestad, *Electronic Devices and Circuit Theory,* 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.

Solve Examples 8.4, 8.5 & 8.6 at your own.

References

[1] Robert L. Boylestad, *Electronic Devices and Circuit Theory,* 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.