



Electronics II

Lecture 06
BJT Small Signal Analysis

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Previous Lecture

- re Equivalent Model
 - Common Emitter Configuration.
 - Common Collector Configuration.
- BJT Small Signal Analysis
 - CE Fixed Bias Configuration.



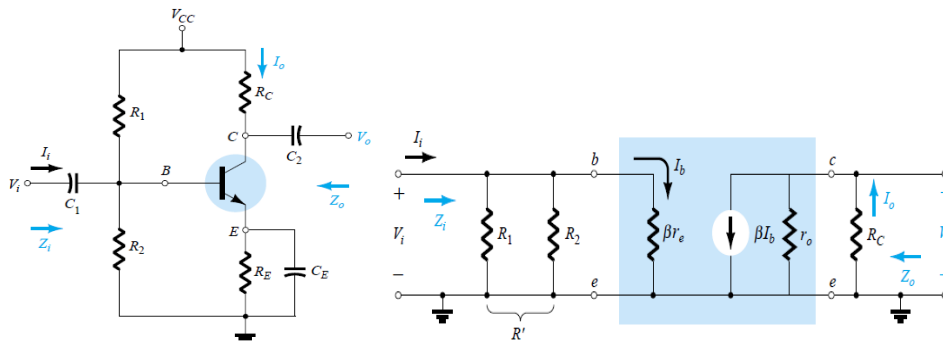
Session Overview

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

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

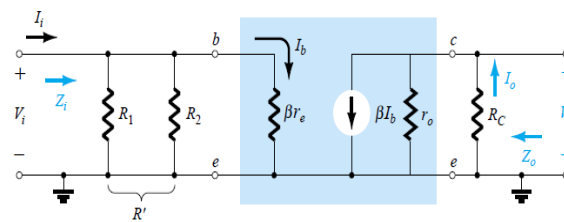


Robert L. Boylestad, *Electronic Devices and Circuit Theory*, 8th Edition, Pearson Education Inc, ISBN: 81-7808-590-9.



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

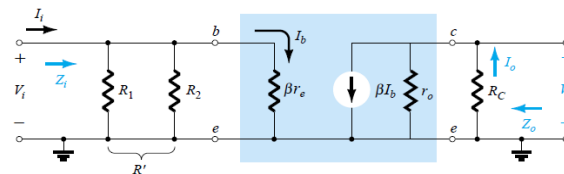
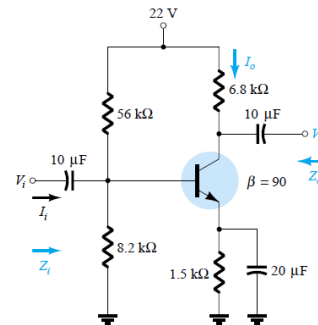


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CE Voltage Divider Bias Configuration

- *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.

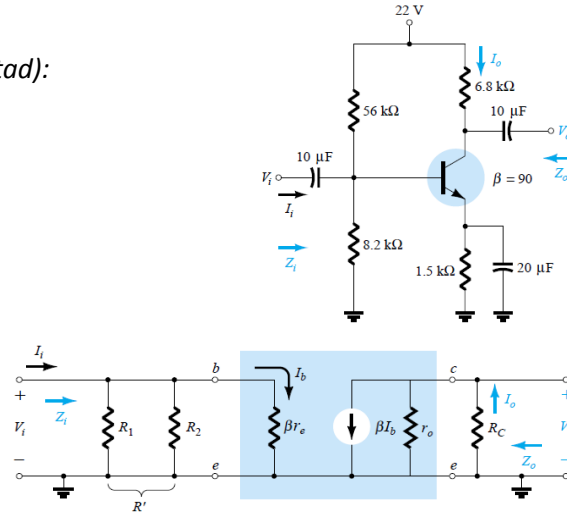


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CE Voltage Divider Bias Configuration

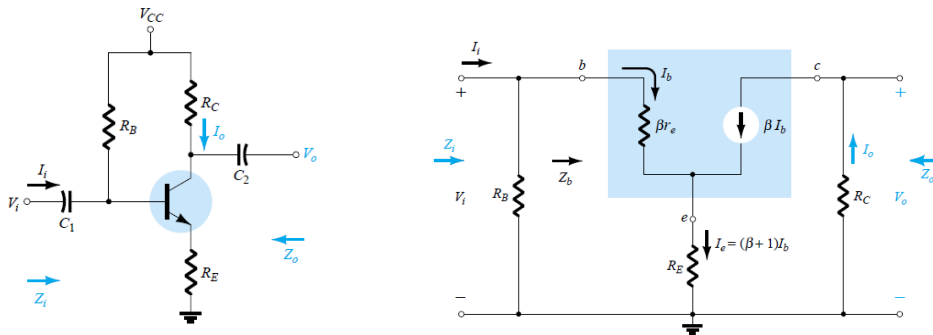
- Sol. Example 8.2 (Boylestad):



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CE Emitter Bias Configuration (RE Unbypassed)

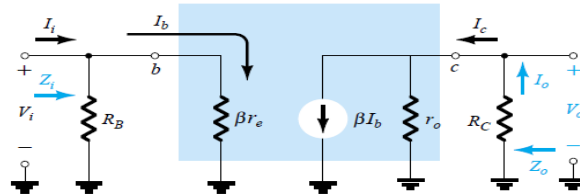


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CE Emitter Bias Configuration (RE Bypassed)

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

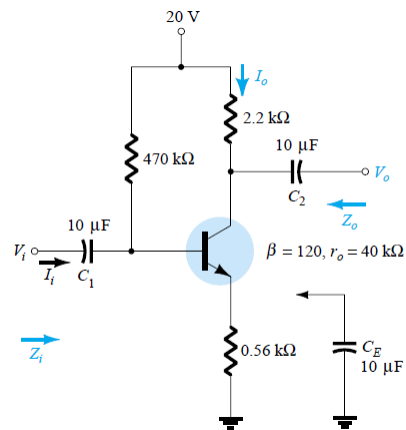


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CE Emitter Bias Configuration

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



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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.