MidTerm Results and Overall Performance

Midterm:

Average: 69%.

High Score: 94%.

Lab Books: The lab books have been improving … mostly (write down as much as you can).

→ You should expect to do more analysis at home after the lab.

Lab Report: Quality has been decreasing … mostly. You need to invest more care and effort into your lab reports.

Transistors II: AC transistor Amplifiers

Emitter-Follower Amplifier Summary

Pros:

- Power/Current Gain.
  →Speaker got louder.
- Simple.
- Moderate input impedance.
- Does not depend on *β*.

Cons:

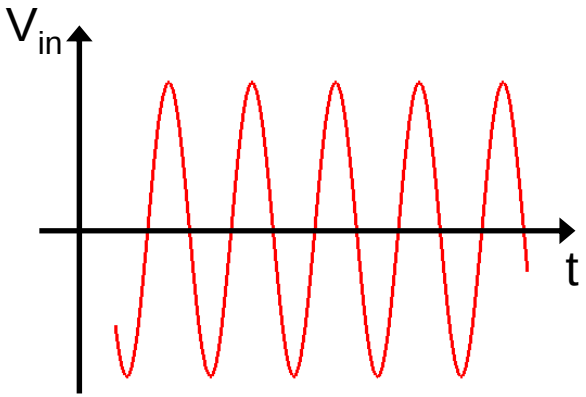
- Requires a DC bias.
  → Signal cannot be negative !
  → Signal must be larger than 0.6 V.
- Cannot provide ***Voltage Gain***.
- Significant power consumption.

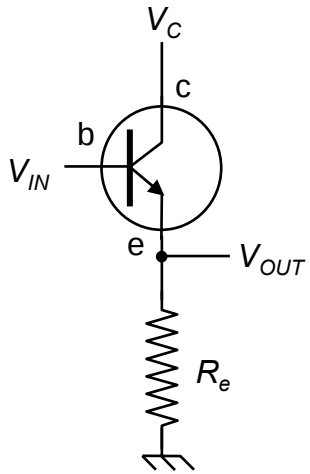
The DC bias problem

There are 2 simple solution to the DC bias problem:

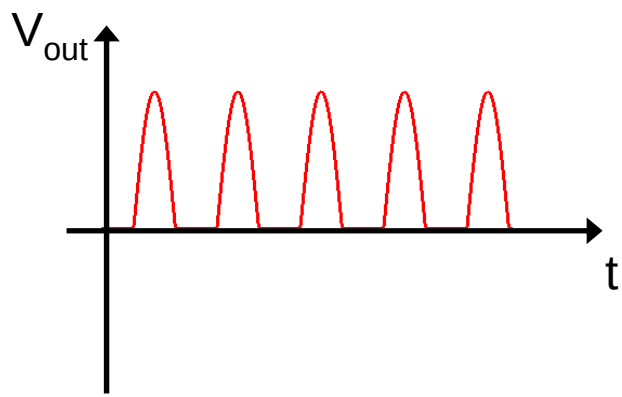
- ***Push-Pull*** **amplifier.**
- **AC-coupled biased-amplifier**

Push-Pull BJT Amplifier (I)

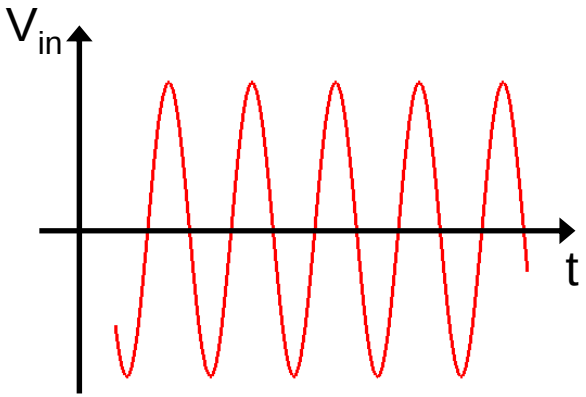


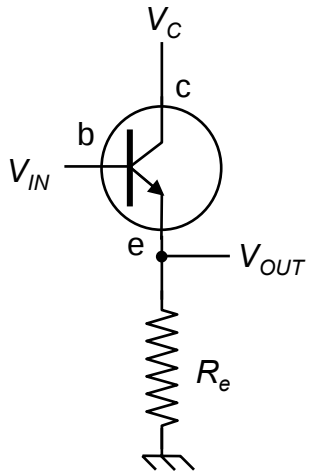


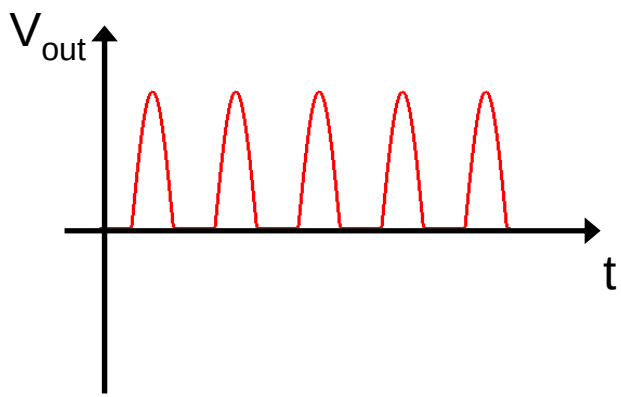
NPN Emitter Follower



Push-Pull BJT Amplifier (I)







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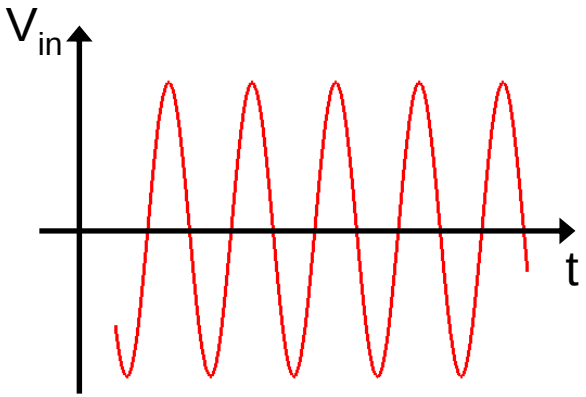
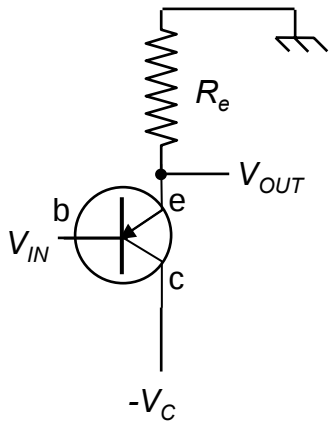
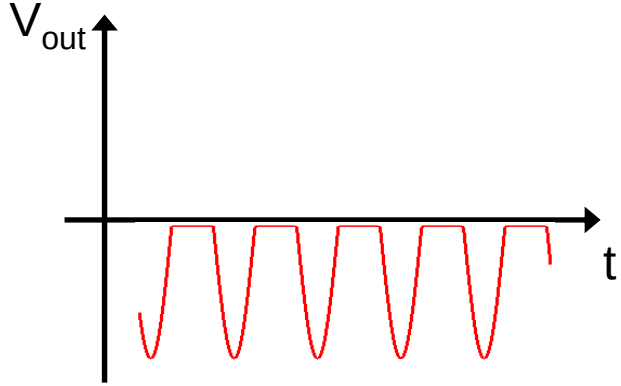


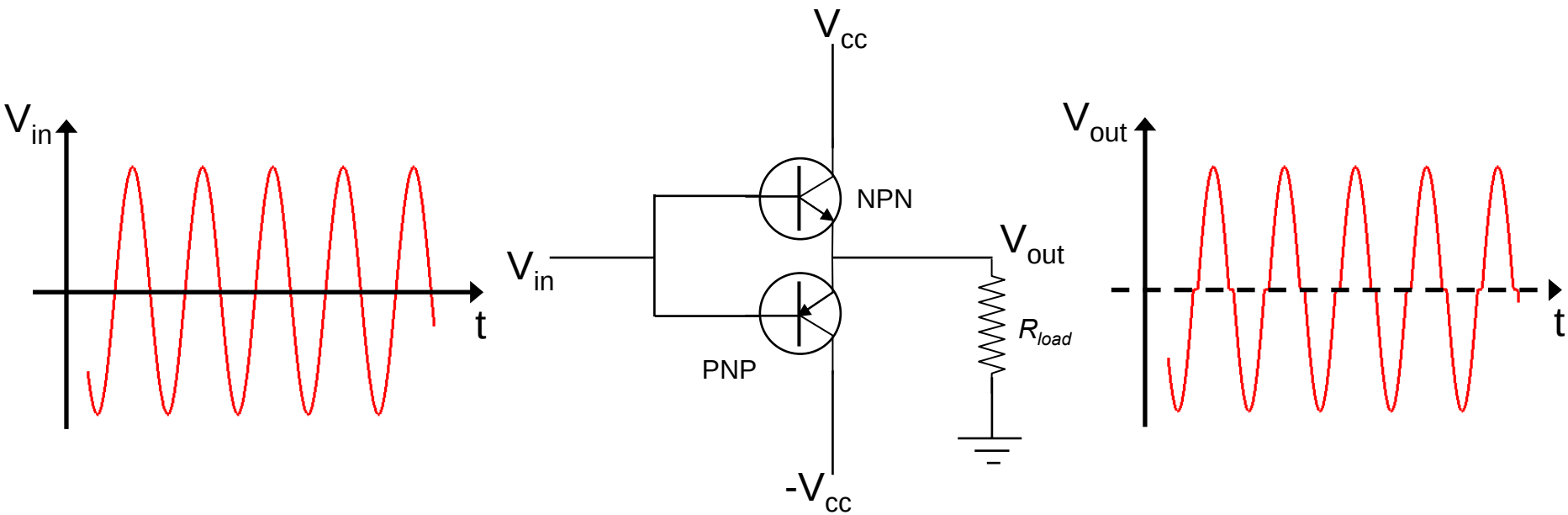




PNP Emitter Follower

Push-Pull BJT Amplifier (II)

Combine both circuits:



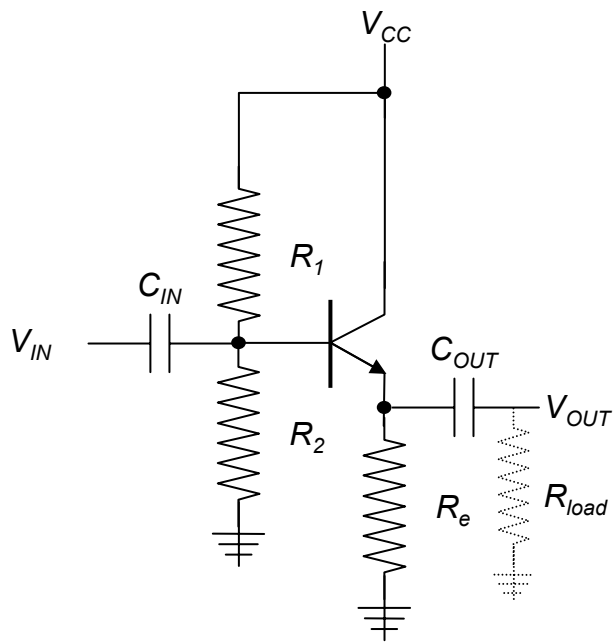
Push-Pull BJT Amplifier

No DC bias required

AC-coupled Biased-Amplifier

- AC-couple the input and output signals with capacitors (i.e. high-pass RC filters)

- DC-bias the input with a voltage divider.



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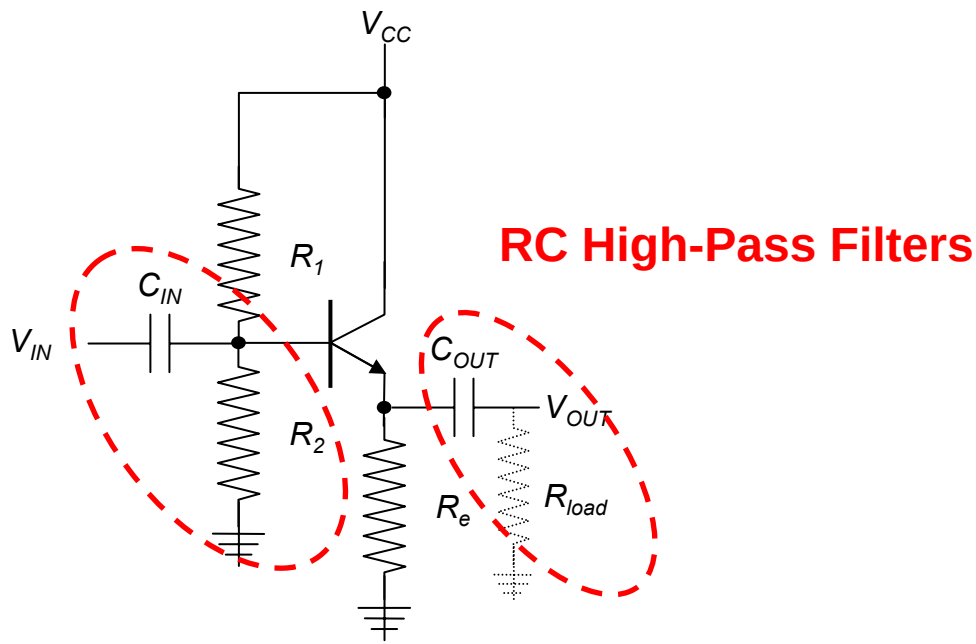

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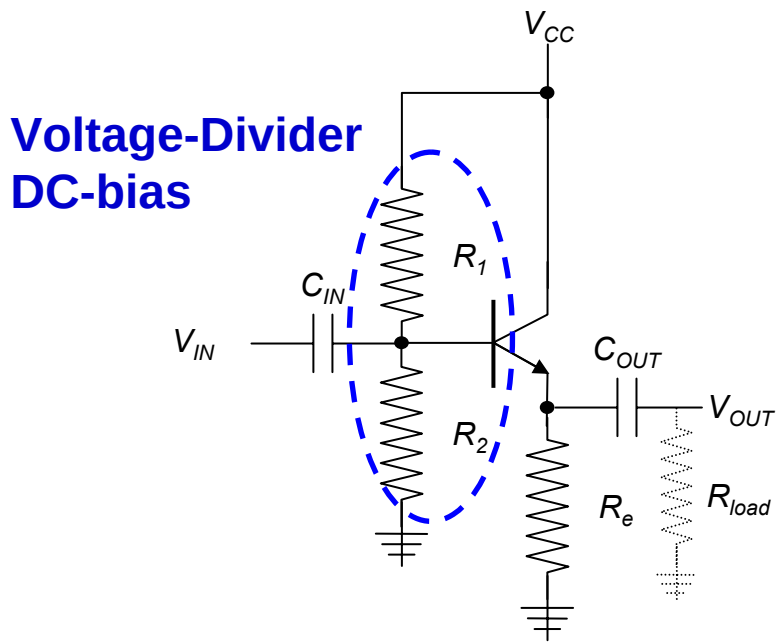

AC Transistor Amplifier Design

4 rules:

- Choose a ***quiescent collector current*** (no load current) which is at least 10x larger than load current.

- Choose $V_{out,\,DC}$ in the middle of the supply voltage range for maximum signal voltage amplitude.

- Choose the DC-bias such that $V_{collector} > V_{base}$ (NPN) to avoid saturation, and $V_{base} \sim V_{emitter} + 0.6$.

- Make sure that the voltage divider DC-bias and the transistor don't load each other (i.e. I_{base} 10x smaller than $I_{voltage\text{-}divider}$).