



McGill University
Department of Electrical and Computer Engineering

ECSE334 Intro. to Microelectronics (Winter 2010)

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PROBLEM SETS 1-5

The underlined problems will be discussed in the Tutorials (in addition to answering your questions on the other assigned problems).

- **Problem Set 1 (Review of BJT Circuits)**

Section 5.4: 5.85

Section 5.6: 5.122

Section 5.7: 5.130, 5.136, 5.143

Section 6.3: 6.29, 6.30, 6.34

Notes:

- Prob. 5.130: Solve on the circuit diagram directly.
Also, find the current gain i_{OUT}/i_{IN} ,
where i_{OUT} (i_{IN}) is the current through the output (input) coupling capacitor.
- Prob. 6.29: Solve all cases, except $I_{REF} = 10\text{mA}$.

- **Problem Set 2 (BJT Differential Pair)**

Section 7.3: 7.30, 7.32, 7.34, 7.35, 7.44

- **Problem Set 3 (BJT Differential Amplifier with: a) Nonideal Characteristics; and b) Active Load)**

Section 7.3: 7.37, 7.38, 7.39, 7.40, 7.42, 7.46

Section 7.4: 7.57

Section 7.5: 7.67, 7.68

Notes:

- Prob. 7.37, 7.38: Derive an expression for the input common-mode range of the differential amplifier, assuming that, for proper operation, the minimum output voltage of the biasing current source (i.e., the minimum voltage drop across the biasing current source) is $V_{\text{bias,min}}$.
- Prob. 7.42: Consider the basic BJT differential pair in Fig. 7.12, with its bias current source having an output resistance of R_{EE} .
- Prob. 7.67: Draw the equivalent transconductance model of the amplifier.
- Prob. 7.68: Skip the common-mode input resistance.
Also solve this problem for the case where each differential-pair transistor has an emitter-degeneration resistor $R_E = 100\Omega$.

- **Problem Set 4 (Multistage Differential Amplifiers)**

Section 7.7: 7.98, 7.99, 7.100

- **Problem Set 5 (MOSFET Differential Pair with: a) Passive Load; and b) Active Load)**

Section 7.1: 7.1, 7.2, 7.8, 7.9

Section 7.2: 7.11, 7.13, 7.16, 7.17

Section 7.5: 7.62, 7.63