University of Michigan
EECS 311: Electronic Circuits
Fall 2008

PROBLEM SET 4

Issued 10/8/2008
Due in Lecture 10/15/2008

J&B refers to the course text: "Microelectronic Circuit Design (3rd Edition)," by Richard Jaeger and Travis Blalock.

For all problems, assume the MOSFET parameters given in Table 4.5 on p197 of J&B. Note that in J&B, the term K' is used to represent $\mu_n C_{ox}$, and K respresents $\mu_n C_{ox} W/L$.

P4.1 J&B Problem 4.8. Ignore body effect.

P4.2 A MOSFET operating in the linear region with very small V_{ds} can be modeled as a resistor between the drain to source given by the expression:

$$R_{DS} = \frac{V_{ds}}{i_{ds}} \approx \left[\mu_n C_{ox} \frac{W}{L}(V_{GS} - V_{th})\right]^{-1}$$

Show how this expression is derived and provide a condition on V_{ds} (i.e. $V_{ds} \ll ?$) that makes this resistor model a reasonable approximation.

P4.3 J&B Problem 4.15. Ignore body effect.

P4.4 J&B Problem 4.22. Ignore body effect and channel length modulation.

P4.5 J&B Problem 4.25.

P4.6 J&B Problem 4.31.

P4.7 J&B Problem 4.43. Include body effect but ignore channel length modulation.

P4.8 J&B Problem 4.49. Include body effect but ignore channel length modulation.