Homework Assignment No. 5

Due on Monday, September 20, 2004

Problems in ( ) refer to the first edition.

1.) Problem 13.102 (13.91) of the text.

2.) Problem 13.111 (13.100) of the text. \[ A_v = -4.60 \text{ V/V} \]

3.) Problem 13.118 (13.108) of the text.

4.) A PMOS common-drain amplifier is shown. Assume the parameters of the transistor are \( k_F = 0.5 \text{mA/V}^2 \), \( V_{TP} = -1 \text{V} \), and \( \lambda = 0 \). (a.) If \( I_{SD} = 0.5 \text{mA} \), find the small signal model parameter values for \( g_m \) and \( r_o \).

(b.) Find an algebraic expression for the small signal input resistance, \( R_{in} \), the output resistance, \( R_{out} \), and the voltage gain, \( v_{out}/v_{in} \).

(c.) Numerically evaluate the small signal input resistance, \( R_{in} \), the output resistance, \( R_{out} \), and the voltage gain, \( v_{out}/v_{in} \).

5.) A NMOS common-source inverting amplifier is shown. Assume the parameters of the transistor are \( K_N = 1 \text{mA/V}^2 \), \( V_{TN} = 1 \text{V} \), and \( \lambda = 0 \). (a.) Find the small signal model parameter values for \( g_m \) and \( r_{ds} \).

(b.) Find an algebraic expression for the small signal input resistance, \( R_{in} \), the output resistance, \( R_{out} \), and the voltage gain, \( v_{out}/v_{in} \).

(c.) Numerically evaluate the small signal input resistance, \( R_{in} \), the output resistance, \( R_{out} \), and the voltage gain, \( v_{out}/v_{in} \).