Homework Assignment No. 5

Due on Monday, February 9, 2004

Problems in ( ) refer to the first edition of the text.

1.) An NPN BJT common-emitter inverting amplifier is shown. Assume the parameters of the transistor are \( \beta_F = 100 \), \( V_T = 25\text{mV} \), and \( V_A = 100V \). (a.) If \( I_C = 0.5\text{mA} \) and \( V_{CE} = 3V \), find the small signal model parameter values for \( g_m \), \( r_\pi \), and \( r_o \). (b.) Find an algebraic expression for the small signal voltage gain, \( v_{out}/v_{in} \). (c.) Numerically evaluate the small signal voltage gain, \( v_{out}/v_{in} \).

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

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

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

5.) A PMOS common-drain amplifier is shown. Assume the parameters of the transistor are \( k_F = 0.5\text{mA/V}^2 \), \( V_{TP} = -1V \), 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, \( v_{out}/v_{in} \).