EECS 140 Fall 2000

Midterm 1

Prof. Brodersen

Use the following parameters unless otherwise stated.
Assume all W/L's are 10.
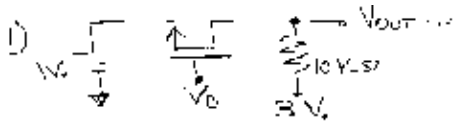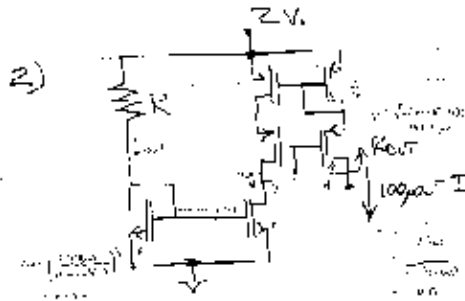Vtn = Vtp = 0.5V
Kn' = Kp' = 100 microA/V^2
LAMBDAn = LAMBDAp = 0.01
GAMMAn = GAMMAp = 0

Problem #1

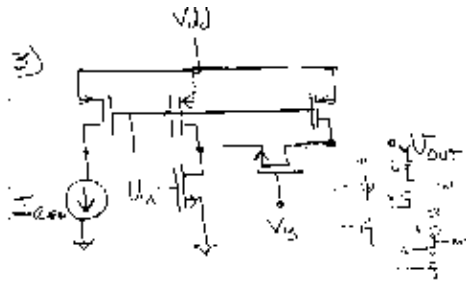
What is the Voltage at Vb so that Vout is 2 Volts?

Problem #2

a.) What is R so that Iout = 100 microA?
b.) What is the output resistance, Rout?
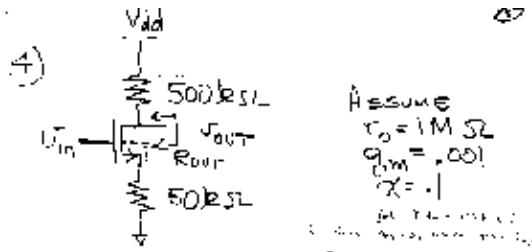
Problem #3

Assume the following small signal parameters for all transistors:
Gm = 0.00125
X = 0.1
R0 = 1 MOHM

What is the gain, Vout/Vin ?
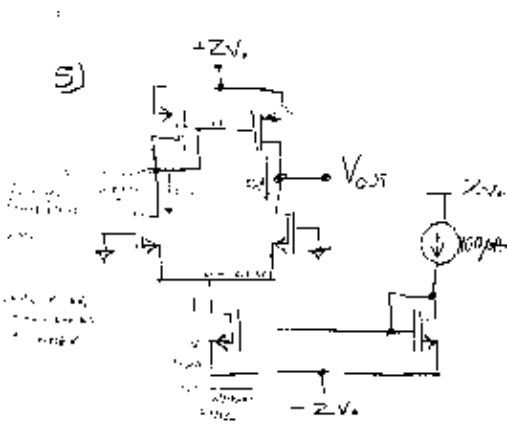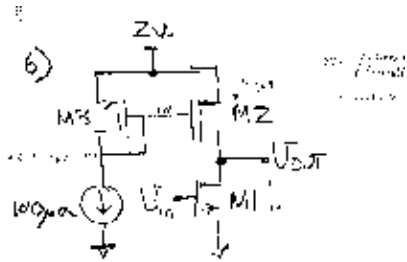
Problem #4

a.) What is Rout?
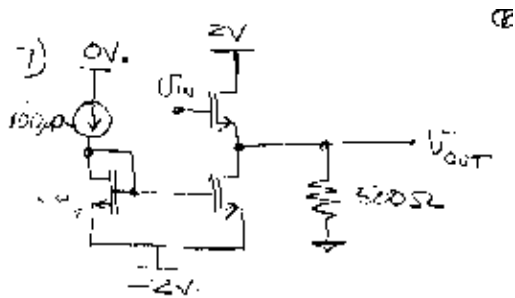b.) What is the gain?

Problem #5

What is the DC voltage at Vout?

Problem #6

What is the maximum and minimum voltage at Vout that keeps all devices in saturation?
a.) Vout,max = ?
b.) Vout,min = ?

Problem #7

a.) What is the maximum and minimum voltage at Vout?
Vout,max = ?   Vout,min = ?

b.) What is the efficiency in percent including all transistors and the current source if the output swing is a sinewave with 0.05 Volt peak to peak amplitude?

ANSWERS:

1.) Vb = 1.945 V

2.) a.) 10.53 KOHM
     b.) 225.6 KOHM

3.) Gain = -1000

4.) a.) 495.2 KOHM
     b.) -9.7

5.) 1.184 Volts

6.) a.) 1.553 Volts
     b.) 0.447 Volts

7.) a.) max = 0.306 Volts, min = -0.05 Volts
   b.) 0.1042%