Name: _____

EE303 - Final Exam

Closed Book:
Two 8.5"x11" sheet of handwritten notes permitted
Calculator permitted

Important Notes:

- Read each problem completely and thoroughly
- Summarize all your answers in the boxes provided on these exam sheets
- Make sure to mark the units on your answers!
- Do all your work on the exams sheets provided. If you use any additional sheets, please turn them in, so we can consider all work for partial credit
- Do not forget to put your name in the space above

Problem #	Points	Score
1	10	
2	20	
3	20	
4	20	
5	20	
TOTAL	**90**	

Unless otherwise specified assume:

NMOS: $\mu_n C_{OX} = 200\ \mu A/V^2$ and $V_{THn} = 0.4V$
PMOS: $\mu_p C_{OX} = 100\ \mu A/V^2$ and $V_{THp} = -0.4V$

Name:

Problem 1 [10 pts]

Consider the differential pair illustrated in Fig. 10.70. Assuming perfect symmetry and $V_A = \infty$,
(a) Determine the voltage gain.
(b) Draw the differential AC half circuit

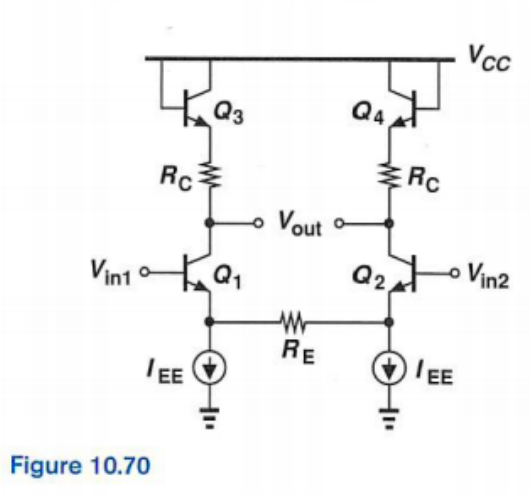

Figure 10.70

$V_{out}/(V_{in1}-V_{in2})$	

Name:

Problem 2 [20 pts]

Calculate the differential voltage gain of the circuits depicted in Fig. 10.76. Assume perfect symmetry and $\lambda > 0$.

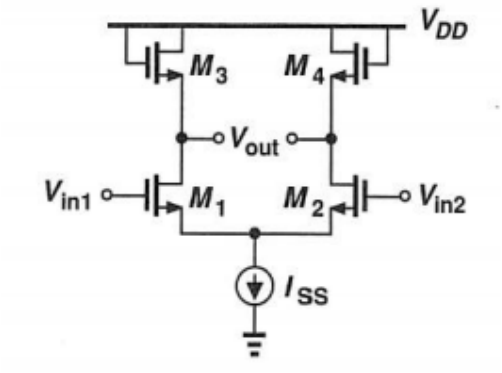

Fig. 10.76 (a)

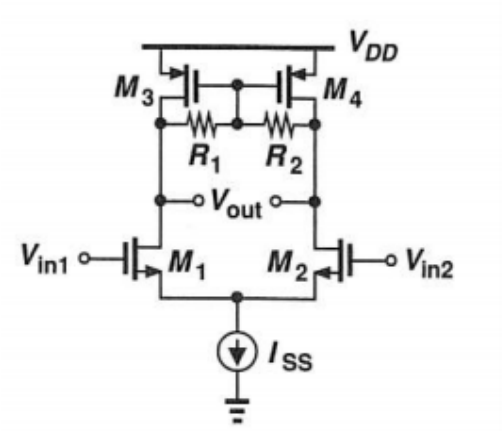

Fig. 10.76 (b)

(a) $v_{out}/(v_{in1}-v_{in2})$ =	
(b) $v_{out}/(v_{in1}-v_{in2})$ =	

Name:

Problem 3 [15 pts]

Calculate I_{copy} in each of the circuits shown in Fig. 9.71. Assume all of the transistors operate in saturation.

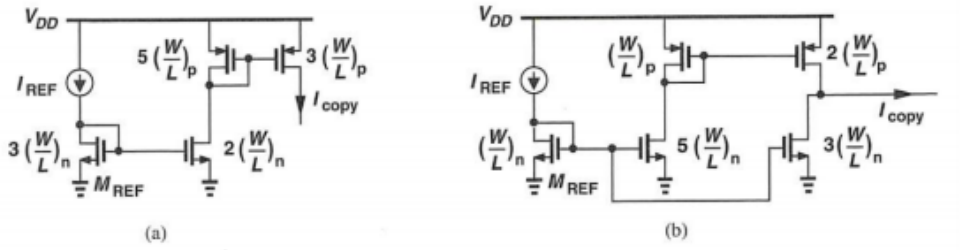

Figure 9.71

a) I_{copy} =	
b) I_{copy} =	

Name:

Problem 4 [20 pts]

Compute the output resistance of the circuits depicted in Fig. 9.50. Assume all of the transistors operate in saturation and $g_m r_O \gg 1$.

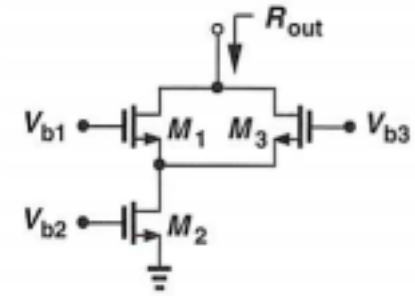

Fig 9.50 (a)

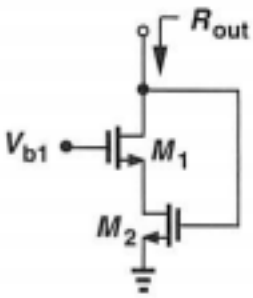

Fig 9.50 (b)

a) R_{out} =	
b) R_{out} =	

Name:

Problem 5 [10 pts]

Consider the circuit shown in Fig. 9.49, where $V_{DD} = 1.8$ V, $(W/L)_1 = 20/0.18$, and $(W/L)_2 = 40/0.18$. Assume $\mu_n C_{ox} = 100\ \mu A/V^2$ and $V_{TH} = 0.4$ V.

(a) If we require a bias current of 1 mA and $R_D = 500\ \Omega$, what is the highest allowable value of V_{b1}?

(b) With such a value chosen for V_{b1}, what is the value of V_X?

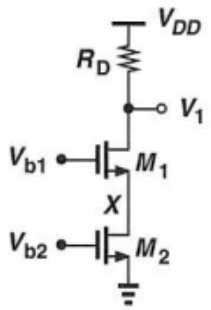

Figure 9.49

(a) V_{b1}(max) =	
(b) V_X =	