EECS105 Midterm 2

Name_____

SID_____

Prob.	Score
1	/20
2	/20
3	/20
4	/15
5	/25
Total	/100

1A) Fill in the following table. Do NOT use a calculator!

dB	Power ratio	Voltage ratio
3		
-3		
0		
20		
-40		
-6		

1B) Short answer – half credit for the right answer, half for the reason that you give.

True or false: MOS transistors have infinite input impedance at all frequencies.

True or false: Miller multiplication always makes capacitors look bigger.

Your friend from Stanford tells you that his common emitter amplifier gain is stable over temperature because he uses a constant voltage source to apply the DC bias to the base. Do you believe him?

2A) Draw an NMOS source follower (common drain) with a resistive load on both the source and the drain. Label the input and the output.
2B) Draw the small signal model for this circuit.
2C) Write down KCL at the output node.
2D) Solve for the block transconductance, G_M.

2A)

2B)

2C) KCL @ v_o

2D) G_M=

3) Fill in the following table for a single-pole amplifier

G_m [S]	R_o [Ω]	C_L [F]	Av	ω_p [rad/s]	ω_u [rad/s]
10u	1M	100f			
		10p		10M	1G
0.1m			100		100M

4) You have a single-pole amplifier with a low frequency gain of 5000, and a gain of 100 at 100MHz. What is the gain at 100kHz, 5MHz, 20MHz, 5GHz, and 20GHz?

Frequency	Gain
100kHz	
5MHz	
20MHz	
5GHz	
20GHz	

5) What is the simplified total impedance and the simplified impedance seen seen "looking up" and "looking down" at the output node indicated in each circuit? Write your answer in terms of g_{mp} , $g_{mn,}$ r_{on}, and r_{op}. Assume that all $g_m*r_o >> 1$ for all combinations of g_m and r_o.

$R_{o1,\ up}$	R_{o1}	G_M
$R_{o1,\ down}$		
$R_{o2,up}$	R_{o2}	
$R_{o2,down}$		
$R_{o3,up}$	R_{o3}	
$R_{o3,down}$		
$R_{o4,up}$	R_{o4}	
$R_{o4,down}$