ECE520 Spring 2009

Test Date: 04/23/2009

Total Problems: 4

Total Pages: 5

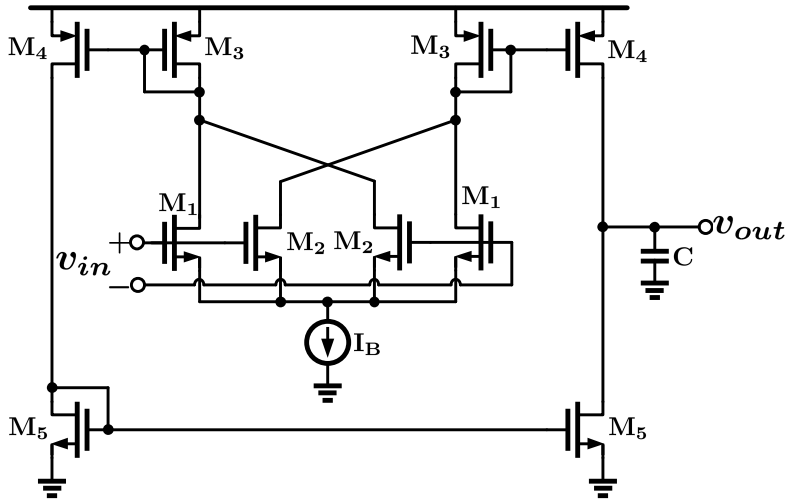
Name: _____

1.	**(20 points)**	_____
2.	**(15 points)**	_____
3.	**(30 points)**	_____
3.	**(35 points)**	_____
Total	**(100 points)**	_____

Good Luck!

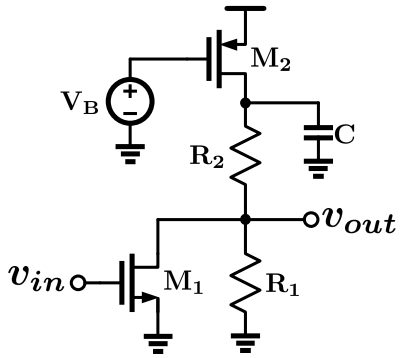
PROBLEM 1. (15+5 points)

Determine an expression for the DC gain and unity-gain bandwidth of the fully-symmetric circuit shown below. The expressions should be in terms of g_ms, r_os and W/Ls. Assume all transistors are biased in saturation region. Ignore all intrinsic capacitances and body effect ($g_{mb} = 0$).



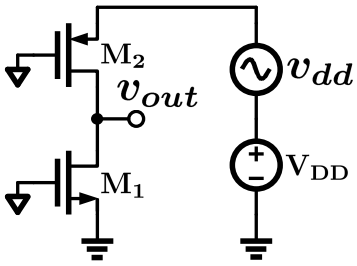
PROBLEM 2. (15 points)

Determine the input-output transfer function, $\frac{v_{out}(\mathrm{s})}{v_{in}(\mathrm{s})}$. Assume all transistors are biased in saturation. Ignore all intrinsic capacitances and assume infinite output impedance ($\mathrm{r_{ds}} = \infty$).

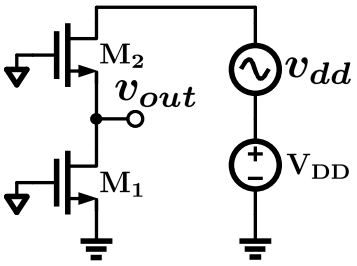


PROBLEM 3. (10+10+10 points)

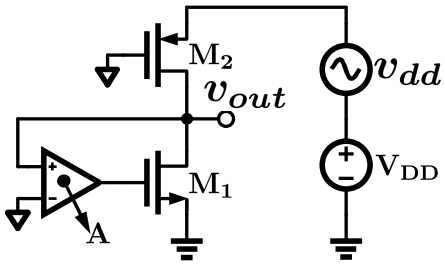
Determine an expression for the DC power-supply rejection ratio (PSRR) for the three circuits shown in Figs. (a), (b), and (c). PSRR quantifies the amount of supply noise that appears at the output and is defined as $\frac{v_{out}(\mathrm{s})}{v_{dd}(\mathrm{s})}$. Assume all transistors are biased in saturation region. Ignore all intrinsic capacitances and body effect ($g_{mb} = 0$).



(a)



(b)



(c)

PROBLEM 4. (30+5 points) (a) Determine an expression for the input-referred voltage of the differential amplifier shown below in terms of threshold mismatch (ΔV_{TH}), relative resistor accuracy ($\frac{\Delta R}{R}$), and relative transistor dimension matching ($\frac{\Delta W/L}{W/L}$). (b) Calculate the variance of the input referred offset voltage. Input-referred voltage is defined as the amount of input voltage needed to achieve zero output voltage. Assume square-law model and all transistors are biased in saturation region. Ignore all intrinsic capacitance and assume infinite output impedance ($r_{ds} = \infty$).