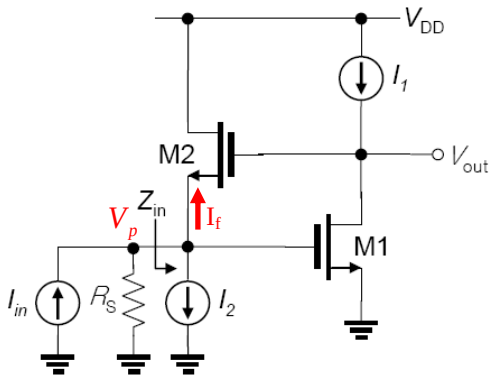
Quiz 6	Subject	Professor	Student ID#	Student Name	Score
Date: 2009.10.14	Microelectronics 2	Jong-Ho Lee			

1. Assume that MOS transistors M_1 and M_2 have a finite r_{o1} and infinite r_{o2} respectively. It is also assumed that current sources I_1 and I_2 are ideal. Answer for the following questions.



(a) Identify the sense and return mechanisms. (2)

Answer)
This topology employs a transimpedance amplifier as the forward system. The feedback network sense the output voltage and return a current to the subtractor. (voltage-current feedback)
M_2 both senses the output voltage and returns a current to the input. M_2 also serves as the feedback network.

(b) Determine the polarity of feedback. (3)

Answer)
If I_{in} increases, V_p increases and I_{D1} increases. As a result, V_{out} decreases(like inverter), thereby decreasing I_{D2}. Finally, V_p decreases. Since the current injected by M_2 into the input node change in opposite directions, **the feedback is negative**.
$I_{in}\uparrow \rightarrow V_p\uparrow \rightarrow I_{D1}\uparrow V_{out}\downarrow \rightarrow I_{D2}\downarrow \rightarrow V_p\downarrow$

(c) Calculate open loop Z_{in} (shown above) and Z_{out}. (2)

Answer)

$$Z_{in} = \frac{1}{g_{m2}} \quad (r_{o2} = \infty)$$

$$Z_{out} = r_{o1}$$

(d) Calculate loop gain. (3)

Answer)

$$\text{Loop gain} = KR_o = g_{m1}r_{o1}$$

Use front side only