

**Indian Institute of Technology, Delhi**  
**EEL782: Analog Integrated Circuits**  
**Final, May 4, 2009**

Answer all the questions. Read the instructions carefully. No books or notes allowed. You should have a working calculator. Full marks is 80. Approximate answers are ok. Incompatible units or unrealistic answers will invoke the wrath of the examiner. Good luck!

**Part A: Objective type questions (1 to 12)**

Each question or fill-in-the-blank carries 1 mark. Total 20 marks.

1. The approximate gain for a single stage amplifier, assuming an infinite load impedance is \_\_\_\_\_.
2. The effect of designing an MOS device with multiple fingers is a reduction in: (a)  $C_{\text{overlap}}$  (b)  $C_{\text{junction}}$  (c)  $C_{gs}$  (d)  $C_{gd}$
3. Through fingering, the above parasitic capacitance can at most be reduced by a factor of \_\_\_\_\_.
4. To match two capacitors, both their \_\_\_\_\_ and \_\_\_\_\_ need to be matched.
5. A capacitor of 100 fF has dimensions of  $10 \mu\text{m} \times 10 \mu\text{m}$ . A 200 fF capacitor matched to the previous capacitor will be of dimensions \_\_\_\_\_  $\times$  \_\_\_\_\_.
6. If an opamp designed with an input differential pair of size  $10 \mu\text{m} \times 1 \mu\text{m}$  shows an input offset voltage of 5 mV, the expected input offset voltage of an opamp with an input differential pair of size  $20 \mu\text{m} \times 2 \mu\text{m}$  is \_\_\_\_\_.
7. To minimize the effect of a linear oxide gradient, the most commonly used layout technique is \_\_\_\_\_ layout.
8. The unit for root mean squared noise voltage per unit frequency is \_\_\_\_\_.
9. Common mode feedback is mandatory for any opamp design. (True / False)
10. Common mode feedback is needed only when we intend to place the opamp in a closed loop configuration. (True / False)
11. A feedback loop senses the current at the output and feeds back a voltage. The units for gain of the forward block are \_\_\_\_\_, and the units for gain of the feedback block are \_\_\_\_\_. The output impedance of the closed loop system will \_\_\_\_\_ by a factor of  $(1+\text{loopgain})$ , and the input impedance of the closed loop system will \_\_\_\_\_ by a factor of  $(1+\text{loopgain})$ .
12. The two halves of a fully differential circuit are excited by the same input signal. The currents through the wires connecting the two half circuits to each other will have components only at \_\_\_\_\_ and the \_\_\_\_\_ harmonic frequencies, and the voltages on those wires will have components only at \_\_\_\_\_ and the \_\_\_\_\_ harmonic frequencies.

