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Dept. of ECE, CEG Campus, Anna University
End Semester Examination Nov 2013 B.E(ECE) VII Semester (FT)
EC 9075 CMOS Analog IC Design I – Building Blocks

Answer All Questions
Part A (10x2=20 Marks)

- Q1. Sketch the V_{DS} versus I_D for a typical MOSFET and the identify regions of operation.
- Q2. Explain what is meant by body effect in MOS transistors.
- Q3. Amongst the three amplifier configurations of CS, CG and Source follower stages for amplifiers, indicate the ones which have the (i) the lowest output impedance and (ii) lowest input impedance.
- Q4. Explain how a MOS transistor can be used as a diode.
- Q5. Explain any one advantage of a cascode amplifier.
- Q6. Explain how the CMRR of a differential amplifier can be increased.
- Q7. Explain the effect of channel length modulation.
- Q8. Give any one expression for the transconductance of a MOSFET.
- Q9. Draw the circuit diagram of any one current mirror and explain its operation.
- Q10. Give the relevant expressions that describe the thermal noise generated by a resistor R

Part B (16x 5 = 80 marks)

- Q11. Draw the small signal equivalent circuit of a common source amplifier including the relevant capacitances. Obtain an expression of the small signal voltage gain and 3dB bandwidth.
- Q12a. Draw the circuit diagram of a any one differential amplifier and obtain expressions for the differential gain and common mode gain.

OR

- Q12b. Draw the circuit of a telescopic cascode amplifier. Explain the difference between cascode amplifier and folded cascode amplifier. Explain how a cascode amplifier helps in extending the bandwidth of operation of an amplifier.
- Q13a. Explain why common mode feedback is required. Explain any two possible circuits for sensing output common mode voltage and two possible circuits for controlling output common mode voltage. Describe the operation of any one Common Mode Feedback Circuit (CMFB).

OR

- Q13b. For the circuit shown below, determine the expression for the minimum common mode input voltage and, minimum and maximum output voltages. Assume that all transistors have to be saturation.
- Q14.a For the circuit shown below, determine the transfer function V_{out}/V_{in} and identify the poles.

OR

- Q14b. Draw the block diagrams of the four possible feedback topologies and explain one important property of each topology.
- Q15a. Draw the noise equivalent circuit of a MOSFET and obtain an expression for the equivalent noise input voltage of a common source amplifier.

OR

- Q15b. Explain what is meant by loop gain. Define the terms phase margin and gain margin used in negative feedback amplifiers. Using Bode plots, explain why a system with a single pole is always stable.

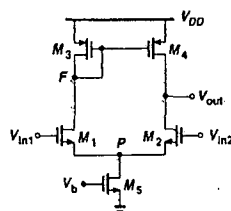


Fig.Q13b

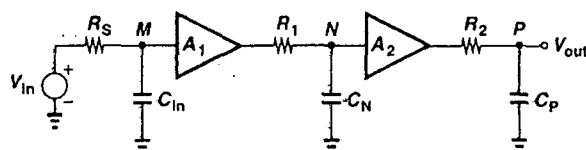


Fig.Q14a