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08EC025

M.Tech. Degree Examination, December 2010
Design of Analog and Mixed Mode VLSI Circuits

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions.***
2. Missing data, if any, may be assumed suitably.

1 a. Explain in detail the second order effects of MOS device. **(10 Marks)**

b. Explain the operation of common gate stage amplifier. Derive an expression for small signal gain and draw its equivalent circuit. **(10 Marks)**

2 a. Derive an expression for voltage gain of a common source stage with resistive load. **(09 Marks)**

b. Calculate the V_{out} for V_{in} = 1.2V in the source follower circuit, if (W/L) = 20/0.5, $I_D = 200\mu A$, $V_{TH} = 0.6V$, μ_{nCox} 50 $\mu A/V^2$. **(05 Marks)**

c. Explain the cascade amplifier and compare with folded cascade amplifier. **(06 Marks)**

3 a. Explain the operation of MOS implemented current sink and source. Hence, explain its characteristics. **(10 Marks)**

b. Design a self biased high swing cascade current sink for a given V_{min} = 0.5V, choose V_{ON}=0.25V, i_{out} = 250 μA. Draw the circuit diagram. **(10 Marks)**

4 a. Explain the general principle of the band gap reference. Derive an expression for reference voltage of a conventional band gap reference. **(10 Marks)**

b. Explain the base principle and the operation of sense amplifier, with a neat sketch. **(10 Marks)**

5 a. Define the following terms with respect to DAC:
i) Full scale ii) Dynamic range iii) Signal to noise ratio iv) Integral non-linearity v) Differential non-linearity. **(06 Marks)**

b. Explain the R – 2R DAC. **(04 Marks)**

c. Explain in detail, with neat diagrams, successive approximation – ADC. **(10 Marks)**

6 a. Explain the operation of sample and hold circuit, with reference to sample mode, hold mode and operture error. **(10 Marks)**

b. What is PLL? Explain the open loop and closed loop transfer function. **(10 Marks)**

7 a. Design and explain procedure for the two stage CMOS op-AMP. **(10 Marks)**

b. What is an oscillator? What are its required conditions? For the Colpitt's oscillator, prove that $g_m R_p = \frac{(c_1 + c_2)^2}{c_1 c_2}$. **(10 Marks)**

8 Write short notes on:

a. Mixer **(07 Marks)**

b. Wilson current source **(07 Marks)**

c. Gilbert cell **(06 Marks)**

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