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12EC025

**M.Tech. Degree Examination, Dec.2013/Jan.2014**  
**Design of Analog and Mixed Mode VLSI Circuits**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions.**

- 1 a. Derive and explain VI characteristics of MOSFET from fundamental concepts. (12 Marks)  
 b. Explain second order effects of MOSFET with neat sketches and VI characteristics. (08 Marks)
- 2 a. Derive an expression for voltage gain of source follower. (10 Marks)  
 b. For the circuit shown below calculate output voltage for input voltage 1.2V and if  $I_1$  is implemented using  $M_2$  find the minimum value of  $(W/L)_2$  for which  $M_2$  remains saturated. Assume  $(W/L)_1 = 16/0.5$ ,  $I_1 = 200\mu A$ ,  $V_{THO} = 0.6V$ ,  $2\phi_f = 0.7V$ ,  $\mu_n C_{OX} = 50 \mu A/V^2$  and  $r = 0.4V^2$ . (10 Marks)

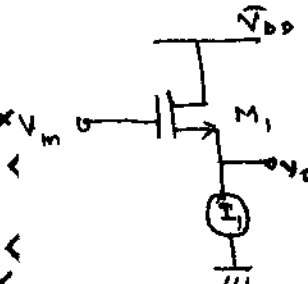


Fig.Q.2(b)

- 3 a. Calculate the input resistance ( $R_i$ ) of the circuit shown in figure and also calculate its output impedance ( $R_o$ ). (10 Marks)

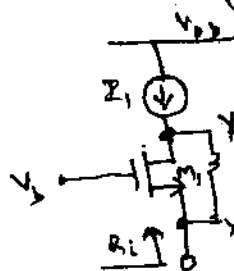


Fig.Q.3(a)

- b. For the circuit shown calculate the transfer function (with  $\lambda = 0$ ) and explain why Miller effect vanishes as  $C_{DB}$  increases. (10 Marks)

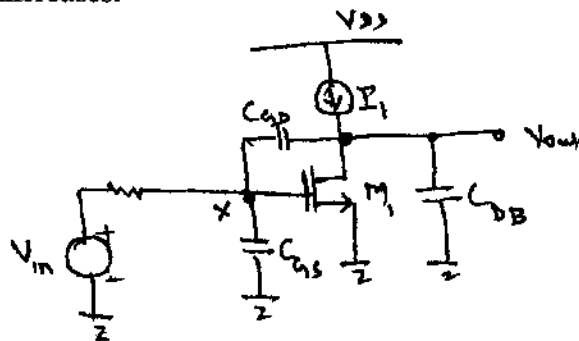


Fig.Q.3(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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- 4 a. Draw the small signal modal of differential amplifier using this model obtain the expression of  $A_v$  and  $V_{out}$ . (10 Marks)
- b. Explain the operation of Gilbert cell with relevant circuit diagram. What are its merits and demerits? (10 Marks)
- a. Explain the design procedure of 2 stages. CMOS Op-Amp circuit. (10 Marks)
- b. Derive an expression for PSRR of CMOS Op-Amp. (10 Marks)
- 6 a. For the Colpitts oscillations shown below prove that  $g_m R_p = \frac{(C_1 + C_2)^2}{C_1 C_2}$  is the condition required for sustained oscillations. (08 Marks)

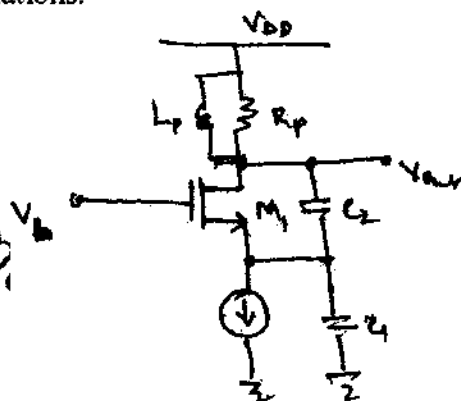


Fig.Q.6(a)

- b. Explain important performance parameters of VCO. (05 Marks)
- c. Explain applications of PLL. (07 Marks)
- 7 a. What are the specifications of ADC? Explain each one of them in detail. (10 Marks)
- b. Draw the diagram of R2R DAC and explain its working. (10 Marks)
- 8 Write short notes on:
- a. Sample and hold circuits.
- b. Comparison of BJT, MOS and BiCMOS technologies.
- c. Common mode rejection ratio.
- d. Differentiate between cascade and folded cascade amplifiers. (20 Marks)

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