BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M. Tech. **SEMESTER : II**
BRANCH: ECE **SESSION : SP/2025**

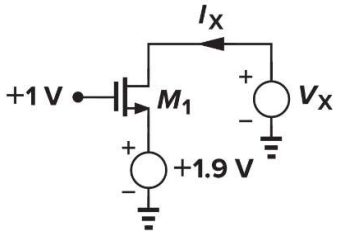
SUBJECT: EC581 Analog VLSI Design

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

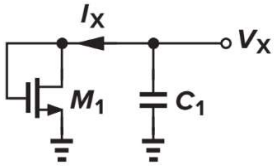
Q.1(a) Calculate the voltage gain of CS Stage with Degeneration. [5]

Q.1(b) Find out I_X as a function of V_X for the circuit shown in figure. Assume that V_X varies from 0 to 1.5 V and threshold voltage of the device is 0.7 V. [5]



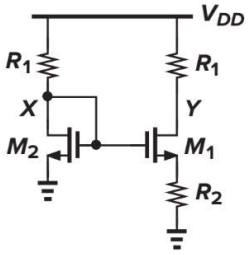
Or

Find out V_X and I_X as a function of time for the circuit shown in figure. The initial voltage of C_1 is equal to 3 V and threshold voltage of the device is 0.7 V.



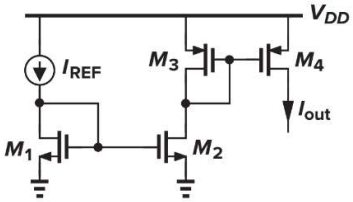
Q.2(a) Explain the working principle of a current mirror along with its derivation. [5]

Q.2(b) Find out V_X and V_Y as a function of V_{DD} for the circuit shown in figure. Assume the transistors in circuit are identical. [5]



Or

Determine the drain current of M_4 for the given circuit, assuming all transistors are in saturation.



Q.3(a) Determine the transfer function of source follower circuit (For High Frequency). [5]

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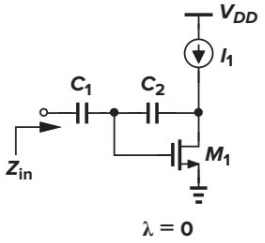
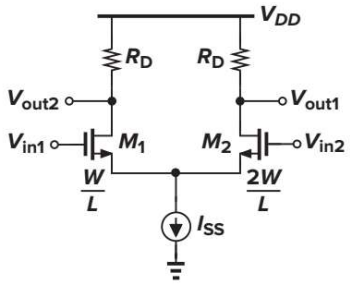
Q.3(b) Neglecting other capacitances calculates the input impedance of circuit shown in figure. [5]



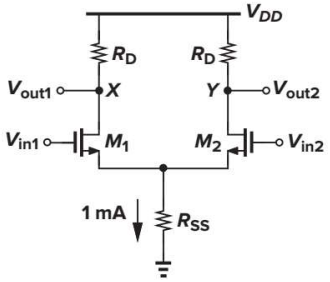
Q.4(a) Find out the Common-mode response of MOS differential amplifier in the presence of resistor mismatch. [5]

Q.4(b) Due to a manufacturing error, in the circuit shown in figure, M_2 is twice as wide as M_1. Calculate the small-signal gain if the dc levels of Vin1 and Vin2 are equal. [5]



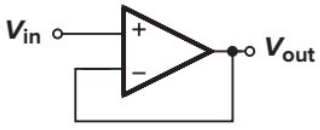
Or

The circuit shown in figure uses a resistor rather than a current source to define a tail current of 1 mA. Assume that $(W/L)_{1,2} = 25/0.5$, $\mu_n C_{ox} = 50\ \mu A/V^2$, $V_{TH} = 0.6$ V, $\lambda=\gamma= 0$, and $V_{DD} = 3$ V.
(a) What is the required input CM voltage for which R_{SS} sustains 0.5 V?
(b) Calculate R_D for a differential gain of 5.



Q.5(a) Derive the voltage gain of Five-transistor OTA. [5]

Q.5(b) Sketch the large-signal input-output characteristic of the unity-gain buffer shown in figure if the op amp is realized as a five-transistor OTA. [5]



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