PVL206 Analog Integrated Circuit Design

Assignment 3

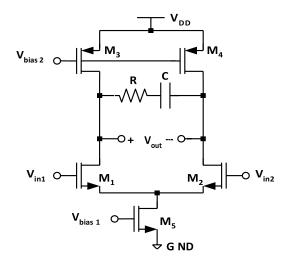
Due: March 20th, 2022 at 12:00am

Course Instructor- Dr. Arun Kumar

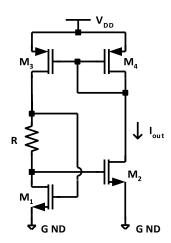
Submission Link- https://forms.gle/MDWchQEQk8q16ZUcA

- 1. In the following circuit assume transistors M_1 and M_2 , and transistors M_3 and M_4 are identical and $\gamma=0$:
- and $\gamma = 0$: and $\lambda \neq 0$:

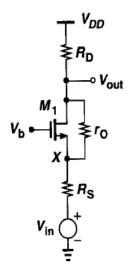
 i) Find the expression for the small-signal differential voltage gain $(\frac{V_{out}}{V_{in1} V_{in2}})$ of the circuit.
- ii) What is the gain of the circuit at very low frequencies?
- iii) What is the gain of the circuit at very high frequencies?



- 2. Assuming all transistors in saturation and ignoring CLM and Body effect, Also, (W/L)₃=(W/L)₄
 - i) Find an expression for Iout.
 - ii) What would be the percentage change in I_{out} if V_{DD} is increased by 10%.
 - iii) How would the expression for I_{out} derived in part (i) change if $\gamma \neq 0$ and why?



3. Calculate the gain of the common-gate amplifier as shown below considering both CLM and Body-effect.



- 4. Explain the working of folded cascode circuit using large-signal analysis. [Hint: Refer Page 90 of Razavi's Book]
- 5. Explain the operation of Gilbet cell. Can Gilbert cell operate as an analog voltage multiplier? [Hint: Refer Page 126 of Razavi's Book]
- 6. Problem 4.16 of Razavi's Book Assuming all the circuits to be symmetric, Plot V_{out} as V_{in1} and V_{in2} vary differentially from 0 to V_{DD} .

