M.TECH. VLSI AND MICRO ELECTRONICS FIRST YEAR FIRST SEMESTER - 2024

Subject : ADVANCED ANALOG IC DESIGN

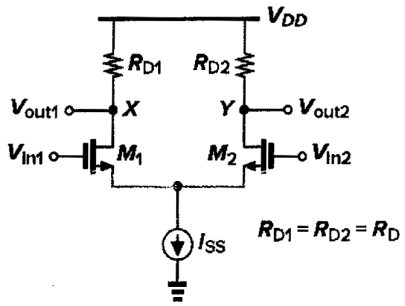
Time : 3 hours **Full Marks :100**

Instructions : Answer any five questions and write answers of all parts of a question together

1.a)Write the drain current expression and list the large signal model parameters of a long channel nMOSFET. [5]
b)Explain channel length modulation. [5]
c)Explain the change of threshold voltage with the application of body bias. [5]
d) In a long channel nMOSFET calculate the threshold voltage when a body bias of 5V is applied. Given that V_{FB}=0.2V, N_A=10^{17}/cc, t_{ox}=10nm ε_{Si}=11.9ε_0, ε_{ox}=3.9ε_0, ε_0=8.85×10^{-12} F/m . [5]

2.a)Draw and explain the MOS diode as an active resistor. Find the expression for the resistance offered. [5+5]
b)Draw and explain the n-channel current mirror. Discuss three non-ideal effects that cause the current mirror deviate from the ideal situation. [4+6]

3.a)Explain the advantages of Differential amplifier over single ended amplifier. [5]
b) Draw the block diagram of an OPAMP and briefly explain the function of each stage. [5]
c) From the large signal analysis of the basic nMOS differential pair of below Fig. derive the expression for the differential voltage gain. [10]



4. a) List the requirements to design an OP-Amp. [5]
b) Explain the large signal transconductance characteristics of a CMOS differential amplifier. [10]
c) Draw a CMOS differential amplifier with current mirror load. Write the expression for ICMR. [5]

5.a)Explain Miller effect in common source amplifier. If the gate-drain capacitance is 1pF and gain of the amplifier is -50 then calculate the Miller capacitance at the input side of the amplifier. [3+2]
b)Draw and explain Cascode Amplifier to avoid Miller effect. [10]
c)Draw a simple Cascode amplifier with active load. How can it reduce the Miller effects? [2+3]

6.a)What are the advantages and disadvantages of BiCMOS over MOSFET and BJT. [5]
b) Draw and calculate the composite transconductance of Darlington pair BiCMOS circuit. [2+5]
c) Explain a BiCMOS current mirror. [8]

7. a) Discuss the primary advantages and disadvantages of switched capacitor circuits. [5]
b) Design a resistance with the help of a switched capacitor. [10]
c) For a parallel switched capacitor circuit of a resistor if clock frequency is 250KHz, C_1=C_2=C, find the value of capacitor to design a 1MΩ resistor. [5]