Question Paper

Exam Date & Time: 13-Aug-2022 (10:00 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

Mnaipal School of Information Sciences, Manipal

Second Semester Master of Engineering - ME(VLSI Design) Degree Examination(Makeup)- August 2022

Advanced VLSI Design [VLS 5201]

Marks: 100

Duration: 180 mins.

Saturday, August 13, 2022

Answer all the questions.

- 1) A) What are the different ways of fabricating CMOS Resistors? (10)B) Discuss the resistor layout techniques and practical considerations in a CMOS process. (5+5) (TLO 1.1) 2) What are the different types of MOSFET parasitic capacitances that show up at high frequency? (10)Explain with a model. (TLO 1.2)
- A) List the applications of a current source/current mirror. (10)3) B) Design four current sinks with values 20, 30, 50 and 70 µA. What is the minimum voltage across each current sink? Assume V_{DD} = +5V and V_{SS} = 0V. Make necessary assumptions. (5+5) (TLO 2.1)Explain the working of a regulated cascode current mirror with a neat schematic and a small-signal (10) 4)
- model. (TLO 2.1) A) With the help of a diagram, explain a CMOS Common-Source amplifier with current source load. (10) 5) B) Calculate the small-signal voltage gain, Av, for the circuit shown in Fig. 5(b). Assume that M1 is

biased in saturation and I1 is an ideal current source.

[Data: $K_n = 50\mu A/V^2$, $W = 10\mu m$, $L = 5\mu m$, $V_{GS} = 1.2V$, $V_{th} = 0.856$, $r_0 = 1.7M\Omega$] (5+5) (TLO 3.1)



Fig. 5(b)

With a neat schematic diagram, explain the Threshold Voltage Referenced Self-Biasing circuit. (10)6) (TLO 2.2) With a neat schematic, derive an expression for small-signal voltage gain for an NMOS differential (10) 7) amplifier with passive resistor load. (TLO 4.1) 8) What do you mean by charge injection and clock feedthrough in a MOSFET switch? Discuss a (10)method used to reduce their effect. (TLO 5.2) 9) How an adaptive biasing circuit is better compared to an ordinary biasing circuit? With a neat (10)schematic, explain an adaptively biased differential amplifier. (TLO 5.1)

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