# **Question Paper**

Exam Date & Time: 29-May-2023 (10:00 AM - 01:00 PM)



# MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal Second Semester Master of Engineering - ME (VLSI Design) Degree Examination - May 2023

### Advanced VLSI Design [VLS 5201]

#### Marks: 100

Duration: 180 mins.

### Monday, May 29, 2023

## Answer all the questions.

1)	<ul><li>a) List and explain the different ways of fabricating CMOS Resistors?</li><li>b) Discuss the resistor layout techniques and practical considerations in a CMOS process.</li></ul>	(10)
2)	Starting from a general 2-port network, model a complete low frequency, small signal model for a MOSFET.	(10)
3)	With diagram, explain a basic current mirror using MOSFETs, taking into account the channel length modulation.	(10)
4)	a) List the applications of a current source or a current mirror. b) Design four current sinks with values 20, 30, 50 and 70 $\mu$ A. What is the minimum voltage across each current sink? Assume V <sub>DD</sub> = +5V	(10)
	and $V_{SS} = 0V$ , L = 5µm, $V_{GS} = 1.2V$ , $V_{th} = 0.83V$ , Lambda = 0.06/V, Kn = 50µA/V <sup>2</sup> . Make necessary assumptions.	
5)	<ul><li>a) List the different performance parameters of an amplifier? Show the dependencies among them using <i>'analog design octagon'</i>.</li><li>b) Explain the three amplifier topologies? Compare them as far as voltage-gain, input impedance and output impedance are concerned.</li></ul>	(10)
6)	With the help of a schematic diagram and a small-signal equivalent circuit, develop an expression for the small-signal voltage gain for a CMOS Source-follower with passive resistor load. What are its applications?	(10)
7)	With neat schematic diagrams, explain the Threshold Voltage Referenced Self-Biasing circuit.	(10)
8)	What is a <i>sample-and-hold</i> circuit? Explain a fully differential sample-and-hold circuit with diagram.	(10)
9)	Briefly discuss DAC and ADC specifications.	(10)
10)	With the help of neat diagrams, explain the working of Cyclic DAC and Pipeline DAC.	(10)

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