

**M. Tech.-II (Electronics V.L.S.I.) (CBCS – 2015 Course) : SUMMER  
- 2019**

**SUBJECT : ANALOG VLSI DESIGN**

Day : Thursday  
Date : 06/06/2019

**S-2019-3406**

Time : 11.00 AM TO 02.00 PM  
Max. Marks : 60

**N. B. :**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SAME** Answer book.
- 4) Draw neat and labeled diagram **WHEREVER** necessary.
- 5) Assume suitable data, if necessary.

**SECTION – I**

**Q. 1** Derive an expression of  $R_{ON}$ . Draw MOSFET characteristics. (10)

**OR**

How MOSFET is modeled? Discuss subthreshold MOS model. (10)

**Q. 2** What is MOS diode? How it is designed? (10)

**OR**

What is the role of current mirror in analog VLSI design? How it is designed? (10)

**Q. 3** What is differential amplifier? How it is designed? (10)

**OR**

For p-channel input differential amplifier, Calculate  $g_{md}$  and  $A_v$ , when  $I_{SS} = 10 \mu A$  and  $I_{SS} = 1 \mu A$ . What is the slew rate if  $C_L = 100 \text{ pF}$ ? For n-channel, parameters are  $V_{TO} = 0.7V$ ,  $K' = 110 \mu A/V^2$ ,  $\lambda = 0.04 V^{-1}$  and p-channel, parameters are  $V_{TO} = -0.85V$ ,  $K' = 50 \mu A/V^2$  and  $\lambda = 0.05 V^{-1}$ . (10)

**SECTION – II**

**Q. 4** Why cascode OP-AMP is used? What are the cascoding technique? Describe any one. (10)

**OR**

How two stage CMOS OP-AMP is designed? (10)

**P. T. O.**

**Q. 5** How high frequency OP-AMP is designed? (10)

**OR**

Calculate power dissipation, gain, GB, SR of the low power OP-AMP, if (10)

$I_{D5} = 200 \text{ nA}$ ,  $I_{D7} = 500 \text{ nA}$ ,  $L = 1 \mu\text{m}$ . Values of parameter  $n$  are 1.5 and 2.5 for p-channel and n-channel transistors respectively.

Given that  $C_c = 5 \text{ pF}$ ,  $\text{temp} = 27^\circ \text{C}$ ,  $V_{DD} = 1.5 \text{V}$ ,  $V_{SS} = -1.5 \text{V}$ .

For n-channel, use parameters  $V_{TO} = 0.7 \text{V}$ ,  $K' = 110 \mu\text{A}/\text{V}^2$ ,  $\lambda = 0.04 \text{V}^{-1}$  and p-channel parameters are  $V_{TO} = -0.85 \text{V}$ ,  $K' = 50 \mu\text{A}/\text{V}^2$  and  $\lambda = 0.05 \text{V}^{-1}$ .

**Q. 6** What is SC Integrator? How it is designed? (10)

**OR**

How SC circuits are designed? Explain using suitable equations. (10)

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