Total No. of Questions : 8]

SEAT No. : [ ]

P5403

[Total No. of Pages : 2

[5562]-264

M.E. (E &TC) (VLSI & Embedded Systems)

ANALOG CMOS DESIGN

(2017 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates :

1) ***Attempt any five questions.***
2) ***Figures to the right in bold indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) How does MOSFET behave as PN diode? What are its applications? Give the expressions for its DC current and dynamic resistance. **[5]**

b) With the help of a diagram, explain small signal high frequency model for the MOS transistor. Also draw large signal model. **[5]**

Q2) a) Explain the effect of channel length modulation and body effect on MOSFET & show how these are accounted in basic small signal model. **[4]**

b) What is need of voltage/current references? Explain in detail the concept of BGR with its necessity. **[4]**

c) List the performance parameters of voltage reference circuits. **[2]**

Q3) a) What do you mean by large signal, small signal analysis? Draw the schematic of CMOS difference amplifier with current mirror load give the expression for Gmd, ICMR, CMRR and 3dB frequency. **[5]**

b) What are limitations/constraints due to output offset voltage of CMOS op amp. **[3]**

c) Which are dominant noises in CMOS Op amp? List the techniques to reduce this noise. **[2]**

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Q4) a) Compare Active load, Current source load and Push-pull inverter with respect to important performance parameters. **[4]**

b) What is CS-CG cascode amplifier, draw its schematic and discuss its advantages/disadvantages over single stage amplifier. **[4]**

c) What is effect of source degeneration resistance on the voltage gain of CS amplifier? **[2]**

Q5) a) List and explain important static and dynamic characteristics of comparator. **[3]**

b) What is need of compensation in multistage amplifiers. Explain Miller Compensation in two stage CMOS Op amp. **[5]**

c) How propagation delay is related with slew rate, derive the relation. **[2]**

Q6) a) Draw and Explain Following Analog Circuits (Any Two) : **[5]**

i) Cascode Current mirror Source.

ii) Single ended and double ended CMOS differential amplifiers.

iii) CMOS Comparator.

b) Write a note on stability of Op amp and its effect on slew rate. What are different ways to improve stability? **[5]**

Q7) a) Explain differential LNA with neat circuit diagram. **[4]**

b) With the help of schematic in detail, explore the design steps of single ended LNA. **[4]**

c) Explain Spurs in Mixer. **[2]**

Q8) a) How to use zeros as bandwidth enhancer? Explain shunt peaking in amplifier. Give the expression for extended bandwidth. **[4]**

b) How nonlinear systems work as linear mixers. Explain square-law MOSFET mixer with neat circuits. **[4]**

c) What are the techniques to improve the bandwidth? **[2]**

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