

Total No. of Questions : 8]

SEAT No. :

P3142

[Total No. of Pages : 2

[5872]-295

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

ANALOG CMOS DESIGN

(2017 Pattern) (Semester - II) (504207)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) How does MOSFET behave as a switch, diode and active resistor?  
What are its applications? [5]

b) Draw a schematic diagram and equivalent small-signal model for the CMOS inverter. Explain the model. [5]

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

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

c) Differentiate between the small-signal and large-signal models for the MOS transistor. [2]

Q3) a) Draw the schematic of the CMOS difference amplifier with the current mirror load. Write the expression for  $ICMR$ ,  $CMRR$  and 3dB frequency. [5]

b) Write a short note on Folded cascade amplifier. [3]

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

P.T.O.

- Q4)** a) With respect to important performance parameters, compare active load, current source load and push-pull inverter. [4]
- b) What is cascade amplifier? Write its advantages and disadvantages over a single-stage amplifier. [3]
- c) What is micropower op-amp? Explain the techniques used in the micropower op-amp. [3]
- Q5)** a) What is the need of compensation in multistage amplifiers. Explain miller compensation in two stage CMOS op-amp. [5]
- b) List and explain important static and dynamic characteristics of the comparator. [3]
- c) How propagation delay is related to slew rate, derive the relation. [2]
- Q6)** a) Draw and explain single-ended and double-ended CMOS differential amplifier. [5]
- b) Write a note on the stability of op-amp and its effect on slew rate. What are different ways to improve stability? [5]
- Q7)** a) State and explain the practical considerations for Low Noise Amplifier (LNA) design. [4]
- b) Explain differential LNA with neat circuit diagram. [4]
- c) Explain spurs in mixer. [2]
- Q8)** a) What are the techniques to improve the bandwidth? How to use zeros as bandwidth enhancer? Explain shunt peaking in amplifier. Give the expression for extended bandwidth. [5]
- b) How nonlinear systems work as linear mixers. Explain square-law MOSFET mixer with neat circuits. [5]

