Code No.: 6113

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, **HYDERABAD**
M.E. I Year (ECE) I-Semester (Make Up) Examinations, May-2015
(Embedded Systems & VLSI Design)

Analog IC Design

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** questions from **Part-B***

Part-A (10 X 2=20 Marks)

1. Explain the reason why all the MOSFETs used in an op amp are always biased in the saturation region?
2. Discuss the limitations of using diffusion resistors as analog components on analog integrated circuits.
3. Explain how the threshold voltage of a MOSFET can be used as a reference in biasing circuits?
4. Discuss the advantages of using current sources as loads in the design of analog amplifiers.
5. Assume that minimum $|V_{DS}|$ required to keep each of the MOSFET devices in a common source amplifier is 150mV. Determine the maximum output swing of the amplifier. Assume a 3.3V power supply.
6. Distinguish between time and frequency domain analysis of noise.
7. Discuss the importance of common mode feedback in fully differential cascode op amps.
8. Explain how a differential amplifier gives a better performance compared to a single input amplifier?
9. Discuss the limitations of LC oscillators.
10. Distinguish between white, flicker and filtered noises.

Part-B (5 X 10=50 Marks)

11.a) Discuss the different types of loads that are used in designing CMOS based amplifier and discuss their relative merits and demerits. (6)
b) Draw and explain the low frequency small signal equivalent circuit of an nMOSFET operated in saturation region. (4)

12. a) Explain the basic features of a source degenerated current mirror and derive the equation for the output impedance of the source degenerated current mirror. (6)
b) Compare the operations of Wilson and cascode current mirrors. (4)

13. a) Draw the high frequency equivalent circuit of a common source amplifier and analyze its frequency response. (7)
b) Discuss the operating principle of a folded cascode amplifier. (3)

14. a) Distinguish between an operational amplifier (OA) and an operational trans-conductance amplifier (OTA). Explain to which type a CMOS cascode amplifier belongs and why? (5)
b) Explain the term phase margin for an op amp and discuss the condition for stable operation of an op amp. (5)

15. a) Explain the operating principle of a ring oscillator and derive the expression for the frequency of oscillation for the ring oscillator. (5)
b) A CMOS inverter has a propagation delay of 1 nS. A ring oscillator is to be designed with an oscillation frequency of 65 MHz. Draw the schematic diagram of the inverter based ring oscillator for this purpose and indicate the number of inverter stages required. (5)

16. a) Explain what is meant by power supply independent biasing. Describe the operation of a self-bias circuit. . (5)
b) Discuss the basic principle behind generating temperature independent biasing. Illustrate with a block diagram. (5)

17. a) Draw the circuit schematic of a two stage CMOS op amp and discuss the inter stage coupling scheme used. (5)
b) Explain the concept of negative resistance oscillator. Illustrate your answer with a suitable example. (5)

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