PAPER ID-310337

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2024-25
CMOS ANALOG VLSI DESIGN

TIME: 3 HRS   **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. **Attempt all questions in brief.**   **2 x 07 = 14**

Q no.	Question	CO	Level
a.	Define the threshold voltage of a MOSFET.	1	K2
b.	Describe the impact of short channel effects on MOSFET performance.	1	K3
c.	Explain the concept of a cascode current mirror.	2	K2
d.	What are the two main types of noise in CMOS circuits?	3	K1
e.	Why is flicker noise significant in low-frequency applications?	3	K1
f.	What is a folded cascode amplifier?	4	K1
g.	Explain the concept of pole-zero compensation.	5	K2

SECTION B

2. **Attempt any three of the following:**   **07 x 3 = 07**

a.	Explain the concept of short-channel effects in MOSFETs. How do they influence device behavior?	1	K2
b.	What is the Miller effect, and how does it impact the frequency response of amplifiers?	2	K1
c.	Explain the difference between thermal noise and flicker noise. Why is flicker noise more prominent at lower frequencies?	3	K2
d.	Explain the design principles of a one-stage CMOS operational amplifier. What are its key advantages and limitations compared to a two-stage opamp?	4	K2
e.	Discuss the importance of Design Rule Check (DRC) in the layout process. How does it ensure the reliability and manufacturability of integrated circuits?	5	K2

SECTION C

3. **Attempt any one part of the following:**   **07 x 1 = 07**

a.	Explain the differences between MOSFET Level 1 and Level 2 models.	1	K2
b.	Compare the operation of a common-source amplifier with a resistive load and a triode load.	1	K3

4. **Attempt any one part of the following:**   **07 x 1 = 07**

a.	Explain the working principle of a basic current mirror and discuss its limitations.	2	K2
b.	Evaluate the impact of small-signal parameters on the performance of an active current mirror.	2	K4

5. **Attempt any one part of the following:**   **07 x 1 = 07**

a.	Discuss how feedback affects the loading effects and overall gain in amplifiers.	3	K2
b.	Explain the concept of feedback in amplifiers and describe the four basic feedback topologies	3	K2

6. **Attempt any one part of the following:**   **07 x 1 = 07**

a.	Explain the concept of gain boosting in operational amplifiers. How does it enhance the performance of low-gain stages?	4	K2
b.	Explain the architecture of a telescopic amplifier and its key features. Why is it often preferred in low-power applications?	4	K2

7. **Attempt any one part of the following:**   **07 x 1 = 07**

a.	Explain the concept of stability in multi-stage operational amplifiers. How do phase margin and gain margin influence stability?	5	K2
b.	Derive the expression for the phase margin of a three-stage operational amplifier. Explain how the phase margin affects the amplifier's transient response.	5	K3