Reg. No | | | | | | | | | | AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M.Tech. (First Semester) Regular Examinations, February – 2025

24MVLPE11011 –Analog IC Design

ECE(VLSI Design)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions

	Question	CO #	Blooms Level
a.	What is the slew rate of an operational amplifier (Op-Amp)?	CO3	K1
b.	What are the different types of feedback used in op-amps?	CO2	K1
c.	Why do op-amps fail at high frequencies?	CO3	K2
d.	What is the Miller effect, and how does it affect amplifier performance?	CO1	K1
e	What are the key operating principles and characteristics of a common-source amplifier?	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions

	Question	Marks	CO #	Blooms Level
2. a.	Discuss the role of feedback topology in operational amplifiers, highlighting its significance in improving gain stability, performance, and overall circuit behavior.	5	CO1	K3
b.	Compare the operational principles of PMOS and NMOS transistors, emphasizing their functional contrasts, advantages, drawbacks, and usage in both analog and digital applications.	5	CO1	K3
	(OR)			
c.	Analyze the concept of Common-Mode Rejection Ratio (CMRR) in op-amps, explaining its importance in suppressing unwanted signal components and improving differential amplifier accuracy.	5	CO1	K4
d.	Differentiate between Common-Source (CS) and Common-Gate (CG) amplifiers, focusing on their voltage gain characteristics, impedance properties, and primary applications.	5	CO1	K2
3.a.	Examine how fluctuations in supply voltage and temperature variations impact operational amplifier performance, and explore strategies to design circuits resilient to these changes.	5	CO2	K3
b.	Compare basic, cascode, and active current mirrors, outlining their distinct characteristics, benefits, and areas of application in circuit design.	5	CO2	K2
	(OR)			
c.	Identify and explain the four key ideal parameters of an op-amp, discussing their influence on the expected behavior and efficiency of an ideal operational amplifier.	5	CO2	K3
d.	Provide an in-depth analysis of MOSFET I/V characteristics, explaining the voltage-current relationships in cutoff, triode, and saturation regions, and discussing essential MOS device attributes.	5	CO2	K4
4.a.	Explain the significance of trans-impedance amplifiers in MOS-based circuits, detailing their role in current-to-voltage conversion, optical sensors, and signal processing applications.	5	CO3	K2

b.	Compare one-stage and two-stage operational amplifiers in terms of design complexity, stability, power efficiency, and suitability for various circuit applications.	5	CO3	K3
	(OR)			
c.	Describe the purpose and function of current mirrors in amplifier circuits, focusing on their role in biasing and maintaining a stable current supply.	5	CO3	K2
d.	Evaluate the trade-offs in high-speed operational amplifiers, discussing how power efficiency, speed, and gain are balanced using techniques like compensation, biasing, and layout enhancements.	5	CO3	K3
5.a.	Explain the influence of IC layout design on analog circuits, exploring how parasitics, noise coupling, and device matching affect the overall circuit performance.	5	CO4	K4
b.	Explain the working mechanism of the Wilson Current Mirror, highlighting its structure, operational principles, advantages, and typical applications in analog circuit design.	5	CO4	K3
	(OR)			
c.	Discuss the contrast between Source-Insensitive Biasing (SIB) and Temperature-Insensitive Biasing (TIB), emphasizing their respective benefits, limitations, and effects on amplifier stability.	5	CO4	K1
d.	Provide a detailed explanation of the Cascode Stage, describing its structural design, working principle, and advantages in achieving higher gain, extended bandwidth, and increased output impedance.	5	CO4	K2
6.a.	Explain how various types of feedback (negative and positive) impact operational amplifier stability, gain control, and circuit response.	5	CO2	K3
b.	Identify and discuss the key sources of noise in operational amplifiers, along with strategies such as filtering, shielding, and optimized layout design to minimize unwanted noise.	5	CO1	K3
	(OR)			
c.	Elaborate on multistage amplifiers, discussing their importance in signal amplification, noise reduction, bandwidth improvement, and key design considerations.	5	CO1	K1
d.	Analyze the impact of the Miller effect in amplifier design, explaining how it affects capacitance, bandwidth, and stability, along with methods to counteract its drawbacks.	5	CO3	K3

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