JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- MAY-2025

B.Tech-IV Semester (ECE)

COURSE CODE(CREDITS): 18B11EC411 (03) MAX. MARKS: 35

COURSE NAME: ANALOG INTEGRATED CIRCUITS

COURSE INSTRUCTORS: Dr. Shruti Jain MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	i. In which mode 555 timer can be used as a frequency divider. ii. Which component is essential in a clamper circuit for maintaining the shifted voltage level? iii. Which pin of the 555 timer is used to reset the timer? iv. Which op-amp configuration is most commonly used in weighted resistor DACs? (inverting summing amplifier / non-inverting summing amplifier) v. Which op-amp-based ADC method uses an integrator and a comparator?	CO2	5
Q2	i. Design a clipper circuit using an op-amp that clips the output signal at +2V and -2V. ii. Design a clamper using an op-amp that adds a DC bias of +5V to an AC signal.	CO2	3 + 2
Q3	Compare a comparator and a Schmitt trigger. When would you use one over the other?	CO2	5
Q4	A 555 timer is configured in astable mode to generate a square wave signal. The circuit uses two resistors, R_1 and R_2, and a capacitor C. The supply voltage V_{CC} is 9V. The output waveform needs to have a frequency of approximately 1 kHz and a duty cycle of 60%. i. Explain the working principle of the 555 timer in astable mode, specifically detailing the function of the threshold,	CO3	2.5 + 2.5

	trigger, and discharge pins during the charging and discharging cycles of the capacitor. ii. Design the circuit.		
Q5	i. Describe the working of an R-2R ladder DAC with an op-amp. How does an op-amp improve the output of a DAC? ii. Why is the op-amp in an inverting configuration in most DAC designs?	CO3	3 + 2
Q6	i. What is an oscillator? What conditions must be met for sustained oscillation in an op-amp circuit? ii. What is the Barkhausen criterion? Name two types of op-amp-based oscillators. What is the function of the feedback network in an oscillator?	CO4	2.5 + 2.5
Q7	i. Define capture range and lock range in a PLL. How are they different? ii. What is the role of the voltage-controlled oscillator in a PLL? iii. List at least three practical applications of PLLs in communication systems.	CO5	2 + 2 + 1