

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fourth Semester

Biomedical Engineering

BM 3402 – Analog and Digital Integrated Circuits

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	List the main applications of an instrumentation amplifier	L1	1	2
2.	How Schmitt trigger provide hysteresis in digital circuits?	L3	1	2
3.	Sketch the block diagram of a PLL.	L1	2	2
4.	How VCO output frequency depends on the input control voltage. Justify?	L3	2	2
5.	Convert the decimal number 175 to binary, octal, and hexadecimal.	L1	3	2
6.	Compare the CMOS and TTL logic families.	L3	3	2
7.	How Carry Look-Ahead Adder differs from Ripple Carry Adder?	L3	4	2
8.	Sketch the schematic design of a 3-to-8-line decoder.	L2	4	2
9.	What is a register in digital systems, and classify the basic types?	L1	5	2
10.	Highlight the applications of counters in digital systems?	L1	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11.	a i Sketch the schematic of an Op-amp with Common-Mode Rejection Ratio (CMRR) and also Discuss its importance in practical applications.	L2	1	8
	ii Discuss the operation of an differentiator with its applications, and analyze how the output changes with varying frequency of the input signal?	L2	1	8

Or

	b	i	What is the role of Slew Rate in integrated circuits and how its helps to determining the speed of an op-amp and affects the performance of high-frequency circuits?	L2	1	8
		ii	Discuss the following of an inverting amplifier. - Op-amp gain - Phase relationship between the input and output	L2	1	8
12.	a	i	Compare the performance of CMOS and JFET analog switches in terms of speed, linearity, and power consumption. Which one would you recommend for low-power, high-speed switching applications and why?	L3	2	7
		ii	Design a a 4-bit weighted resistor DAC with resistors of R, 2R, 4R, and 8R, Calculate the output voltage for the given digital input 1010.	L3	2	9
			Or			
	b	i	In a Flash ADC, how does the number of bits affect the complexity of the comparator network?	L3	2	6
		ii	Analyze the dual-slope ADC with a reference voltage of 5 V and an input voltage of 2 V, calculate the total conversion time.	L3	2	10
13.	a	i	Using a K- map, simplify the Boolean function $F(A, B, C) = \Sigma(0, 1, 4, 5, 6)$.	L2	3	7
		ii	Evaluate the advantages of using Gray code over binary code in minimizing errors in digital systems, specifically in rotating machinery.	L3	3	9
			Or			
	b	i	Compare the advantages and disadvantages of using universal gates over basic gates (AND/OR) in digital logic circuits.	L3	3	9
		ii	Perform the 1's complement and 2's complement of the 8-bit binary number 01101001 and why its is required in digital systems?	L2	3	7
14.	a	i	Design an Excess-3 code converter using Logic gates and write a sample example with your own codes.	L2	4	8
		ii	Discuss the function of a priority encoder and analyze How it id differs from a regular encoder?	L2	4	8

Or

	b	i	Apply the Boolean logic with neat schematic and derive the Boolean equations for the sum and carry outputs of a full adder.	L2	4	8
		ii	Sketch a 4-to-1 multiplexer and design a logic circuit to implement using AND, OR, and NOT gates.	L2	4	8
15.	a	i	Examine the working principle of a JK flip-flop. How does it resolve the issue of the invalid state in the SR flip-flop?	L2	5	8
		ii	Evaluate the impact of edge-triggered flip-flops on the performance of sequential circuits. How do they reduce timing errors compared to level-triggered flip-flops?	L3	5	8
			Or			
	b	i	Design a universal shift register with both shift-left and shift-right capabilities. Explain its control logic.	L3	5	8
		ii	What is a serial in – serial out shift register? Explain its operation and applications.	L2	5	8