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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. (Full Time - Arrear) - END SEMESTER EXAMINATIONS, NOV/ DEC 2023

BIO - MEDICAL ENGINEERING

Semester IV

EC5406 & ANALOG AND DIGITAL INTEGRATED CIRCUITS

(Regulation 2019)

Time: 3hrs

Max.Marks: 100

CO 1	Ability to design new analog linear circuits and develop linear IC based Systems.
CO 2	Understand the concept of application of ADC and DAC in real time systems and Phase Locked Loop with applications.
CO 3	Use Boolean algebra and apply it to digital systems.
CO 4	Design various combinational digital circuits using logic gates.
CO 5	Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	What are all the characteristics of an ideal operational amplifier?	2	CO1	L2
2	Define a function of Monostable Multivibrator?	2	CO1	L1
3	Define sample and hold circuit?	2	CO2	L2
4	Define resolution of ADC circuit?	2	CO2	L3
5	Convert the number $(65784)_{10}$ to hexadecimal?	2	CO3	L4
6	Implement a OR logic gate using an universal NAND gate?	2	CO3	L4
7	Draw a circuit diagram of 2:1 Mux?	2	CO4	L3
8	Distinguish between PAL and PLA?	2	CO4	L2
9	Define Master/Slave FF?	2	CO5	L1
10	Define universal shift register?	2	CO5	L1

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the working, operation, voltage gain and application for inverting and Non-inverting amplifier circuit?	6	CO1	L1
(ii)	Briefly explain about operational amplifier based Differentiator?	7	CO1	
OR				
11 (b) (i)	Explain the working of inverting and non-inverting based comparator with the block diagram and output waveform analysis?	6	CO1	L1
(ii)	Drive the expression of output voltage, peak to peak output voltage and time period for triangular wave generator?	7	CO1	
12 (a)	Write in detail about the function of inverted R-2R ladder DAC. If $R = R_f = 10 \text{ k}\Omega$ and $V_R = 10\text{V}$. Calculate the output voltage for the binary input of 101 with the consideration of inverted R-2R ladder DAC?	13	CO2	L2
OR				

12 (b) (i)	Explain the working of Voltage controlled Oscillator with the block diagram and output waveform analysis?	8	CO2	L2
(ii)	Explain in detail about lock in range of PLL?	5		
13 (a)	Convert the code conversion of 4-bit binary to Gray code and vice versa with implementation of circuit diagram using K-Map?	13	CO3	L3
OR				
13 (b) (i)	Simplify the following Boolean function $F(A,B,C,D) = \Sigma m(0,1,2,4,5,6,8,9,12,13,14)$.	7	CO3	L3
(ii)	Compare the logic families of TTL, MOS and CMOS	6		
14 (a)	Design a 4-bit Carry look ahead Adder using half adder and full adder circuit?	13	CO4	L4
OR				
14 (b)	Design a 4-bit magnitude comparator with a circuit diagram using K-Map?	13	CO4	L4
15 (a)	Design a 4-bit ripple counter with circuit diagram using K-map?	13	CO5	L4
OR				
15 (b)	Design a 4-bit SISO and PIPO shift register sequential logic circuit?	13	CO5	L4

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Consider 4-bit binary number and convert to the following code conversion given below: (i) Excess-3 (ii) 2-4-2-1 and (iii) biquinary	15	CO3	L5

