GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ANALOG AND DIGITAL ELECTRONICS
IT303

TIME ALLOTTED: 3Hours   FULL MARKS:70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any *ten* from the following, choosing the correct alternative of each question: 10×1=10

			Marks	CO No
1.	(i)	How many flip-flops are required to make a Mod-20 binary counter?	1	CO1

    a) 4
    b) 5
    c) 6
    d) 7

(ii) Which format can send several bits of information faster?   1   CO2
    a) Parallel
    b) Serial
    c) Both of these
    d) None of these

(iii) What distinguishes the look-ahead-carry adder?   1   CO3
    a) It is slower than the ripple-carry adder
    b) It is easier to implement logically than a full adder
    c) It is faster than a ripple-carry adder
    d) It requires advance knowledge of the final answer

(iv) One application of a digital multiplexer is to facilitate   1   CO4
    a) Data generation
    b) Serial-to-parallel conversion
    c) Parity checking
    d) Data selector

(v) An astable 555 timer has the following number of stable states: 1   CO1
    a) 0
    b) 1
    c) 2
    d) 3

(vi) The binary numbers A = 1100 and B = 1001 are applied to the inputs of a comparator. What are the output levels?   1   CO2
    a) $A > B = 1, A < B = 0, A < B = 1$
    b) $A > B = 0, A < B = 1, A = B = 0$
    c) $A > B = 1, A < B = 0, A = B = 0$
    d) $A > B = 0, A < B = 1, A = B = 1$

(vii) How is a J-K flip-flop made to toggle?   1   CO3
   a) J = 0, K = 0
   b) J = 1, K = 0
   c) J = 0, K = 1
   d) J = 1, K = 1

(viii) Register is a?   1   CO3
   a) Set of capacitors used to register input instructions in a digital computer
   b) Set of paper tapes and cards put in a file
   c) Temporary storage unit within the CPU having dedicated or general-purpose use
   d) Part of the auxiliary memory

(ix) How many data select lines are required for selecting eight inputs?   1   CO3
   a) 1
   b) 2
   c) 3
   d) 4

(x) Which of the following is not generally associated with flip-flops?   1   CO2
   a) Hold time
   b) Propagation delay time
   c) Interval time
   d) Set up time

(xi) The output of an exclusive-NOR gate is 1. Which input combination is correct?   1   CO2
   a) A = 1, B = 0
   b) A = 0, B = 1
   c) A = 0, B = 0
   d) none of the above

(xii) How many AND gates are required to implement the Boolean expression? AB'+A'B'   1   CO2
   a) 1
   b) 2
   c) 3
   d) 4

GROUP – B
(Short Answer Type Questions)
(Answer any three of the following) 3 x 5 = 15

			Marks	CO No
2.		Why NOR gate is known as Universal Gate? Implement a NOT gate and a AND gate using any NAND Gate.	5	CO1
3.		Design a Full Adder circuit using 2 half-adder circuits.	5	CO2
4.	(a)	Prove the following Boolean identity- (A+B)(A+B')(A'+C)=AC	3	CO2
	(b)	Convert Hexa decimal to binary number: (2E5A)16	2	CO1
5.	(a)	What is race-around condition?	2	CO1
	(b)	How can it be resolved?	3	CO2

6. Design a Synchronous MOD 3 Counter by using J-K flip flop.   5

GROUP – C
(Long Answer Type Questions)
(Answer any three of the following)   3 x 15 = 45

			Marks	CO No
7.	(a)	Define De-Morgan's laws for simplification of Boolean expression	2	CO1
	(b)	Prove that $A + \bar{A}B = A + B$	3	CO1
	(c)	Simplify the expression $\bar{A}B + AB + A\bar{B}$	3	CO1
	(d)	Draw and Explain the working Principle of CMOS	5	CO1
	(e)	Convert $(305)_8$ to $(?)_2$	2	CO1
8.	(a)	What is Shift register?	2	CO2
	(b)	What are the different types of shift register?	4	CO2
	(c)	Explain the working of Serial in-parallel out shift register with logic diagram.	9	CO2
9.	(a)	Explain the characteristics of Op-amp?	5	CO1
	(b)	Identify different types of multivibrator with proper diagram.	7	CO2
	(c)	What do you mean by forward bias? Explain.	3	CO1
10.	(a)	Design a 16 x 1 MUX using 8 x 1 MUX.	6	CO4
	(b)	Using multiplexer simplify the following Boolean Function: $F(A,B,C,D) = \sum_m(1,2,5,6,7,8,10,12,13,15)$.	6	CO3
	(c)	Explain 4-bit R-2R ladder type D/A converter.	3	CO3
11.		Write short notes on any three of the following	3x5=15	
	(a)	Parity checker and generator	5	CO4
	(b)	Single bit Comparator circuit	5	CO2
	(c)	BJT	5	CO4
	(d)	Master-Slave flip-flop	5	CO3
	(e)	Successive approximation ADC	5	CO1