GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
DIGITAL ELECTRONICS
EE403

TIME ALLOTTED: 3 HOURS | 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.
(i)	Gray code for $(1011)_2$ is a) 1000 b) 1101 c) 1110 d) None of these	1	CO1
(ii)	The SOP form of logical expression is most suitable for designing logic circuits using only a) XOR gates b) AND gates c) OR gates d) NAND gates	1	CO2
(iii)	D-flip flop can be used as a) Divider circuit b) Delay switch c) Differentiator d) None of these	1	CO3
(iv)	A 4-stage ripple counter counts upto a) 12 b) 10 c) 15 d) 4	1	CO3
(v)	The 9's complement representation of (3465) is a) 6534 b) 5346 c) 4536 d) 3456	1	CO2
(vi)	The fastest logic gate family is a) CMOS b) ECL c) TTL d) RTL	1	CO4

(vii)	The minimum number of NAND gates required to design one full adder circuit is a) 9 b) 8 c) 10 d) none of these	1	CO2
(viii)	2's complement of 1010111 is a) 0101001 b) 0110110 c) 0101100 d) 0101101	1	CO2
(ix)	The SR latch consists of _____ a) 1 input b) 3 inputs c) 2 inputs d) 4 inputs	1	CO4
(x)	A code converts circuit to the another code a) Encoder b) Decoder c) Both a and b d) Code converter	1	CO4
(xi)	In a J-K flip-flop, if J=K the resulting flip-flop is referred to as _____ a) D Flip-Flop b) S-R Flip-Flop c) S-K Flip-Flop d) T Flip-Flop	1	CO3
(xii)	What type of register would shift a complete binary number in one bit at a time and shift all the stored bits out one bit at a time? a) SIPO b) PIPO c) SISO d) PISO	1	CO3

GROUP – B
(Short Answer Type Questions)
Answer any ***three*** from the following: **3×5=15**

		Marks	CO No.
2.	Realize EX-OR gate using NAND gate.	5	CO2
3.	Apply De-morgan's theorem (i) $\overline{\overline{A} + B + \overline{C}}$ (ii) $\overline{\overline{A} + B + CD}$	5	CO2
4.	Write the logic gate diagram of 1*4 Demultiplexer.	5	CO3
5.	Perform the following operations: (i) Convert Decimal 928 into Hexa decimal (ii) Convert Hexa decimal 7AC .39 to the Binary (iii) Subtract 1101 from 1111 using 2's complement	5	CO2
6.	Minimize the following boolean function- using Kmap $F(A, B, C, D) = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 10, 13, 15)$	5	CO1

GROUP – C
(Long Answer Type Questions)
Answer any ***three*** from the following: **3×15=45**

			Marks	CO No.
7.	(a)	What is difference between combinational and sequential circuits?	6	CO3
	(b)	Simplify f = A'BC' + AB'C +ABC using: (a) Sum of minterms. (b) Maxterms	9	CO2
8.	(a)	Describe the bidirectional shift register with the help of circuit diagram.	5	CO3
	(b)	The figure below shows a full adder truth table	10	CO3

Inputs			Outputs	
A	B	C_{in}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

(i) Write down the Boolean expressions for the sum bit and the carry output bit
(ii) Construct a full adder using combination of AND, XOR and OR gates.

9.	(a)	Design a Master Slave Flip-flop and discuss its operation.	5	CO3
	(b)	Using only one 4:1 MUX, implement the function F (A, B, C) = A + BC+A'B'C'	5	CO4
	(c)	Explain the working of 4 bit PISO shift register with logic diagram and truth table.	5	CO4
10.	(a)	What is counter? Differentiate Synchronous and Asynchronous counters.	5	CO3
	(b)	Simplification using Boolean Algebra: AB + A(B+C) + B(B+C)	5	CO2
	(c)	Draw and give truth table of JK flip-flop. What is race around condition in JK flip-flop?	5	CO3
11.		Write short notes on any three of the following	3x5=15	
	(a)	Decoder	5	CO3
	(b)	D/A & A/D Converters	5	CO4
	(c)	TTL	5	CO4
	(d)	Minimise the following function in SOP minimal form using K-Maps: F(A, B, C, D) = Σm(1, 2, 6, 7, 13, 14, 15) + d(0, 3, 5, 12)	5	CO2
	(e)	Design a 4 bit up down counter.	5	CO4