GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
DIGITAL ELECTRONICS & CIRCUITS
EC403

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
1.	(i)	Which of the following is minimum error code? a) Octal code b) Grey code c) Binary code d) Excess 3 code	1	CO1
	(ii)	The output of an AND gate is LOW _____. a) when any input is LOW b) all the time c) when all inputs are HIGH d) when any input is HIGH	1	CO2
	(iii)	The Boolean expression for a 3-input AND gate is _____ a) X = AB b) X = ABC c) X = A + B + C d) X = AB + C	1	CO1
	(iv)	Which of the following expressions is in the sum-of-products form? a) (A + B)(C + D) b) (AB)(CD) c) AB(CD) d) AB + CD	1	CO1
	(v)	When used with an IC, what does the term "QUAD" indicate? a) 2 circuits b) 4 circuits c) 6 circuits d) 8 circuits	1	CO2
	(vi)	A decoder can be used as a demultiplexer by _____. a) tying all enable pins LOW b) tying all data-select lines LOW c) tying all data-select lines HIGH d) using the input lines for data selection and an enable line for data input	1	CO2

(vii)	How many data select lines are required for selecting sixteen inputs? a) 1 b) 2 c) 3 d) 4	1	CO3
(viii)	What value is to be considered for a "don't care condition"? a) 0 b) 1 c) Either 0 or 1 d) Any number except 0 and 1	1	CO3
(ix)	If both inputs of an S-R flip-flop are high, what will happen when the clock goes HIGH? a) An invalid state will exist b) No change will occur in the output c) The output will toggle d) The output will reset	1	CO3
(x)	A Flip-Flop can Store _____ of information. a) 4 bit b) 1 byte c) 1 bit d) 8 bit	1	CO4
(xi)	Which is not characteristic of a shift register? a) Serial in/parallel in b) Serial in/parallel out c) Parallel in/serial out d) Parallel in/parallel out	1	CO4
(xii)	A MOD 6 asynchronous counter needs _____ no of flip flops a) 2 b) 3 c) 4 d) 5	1	CO5

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

			Marks	CO No
2.		What do you mean by Universal Gate? Which gates are known as by Universal Gate? Implement a NOT gate using NAND Gates.	5	CO1
3.		Design a Full Adder circuit using 2 half adder.	5	CO2
4.	(a)	Mention the difference between Combinational Circuit and Sequential Circuit.	1	CO3
	(b)	Design a full adder using demultiplexer	4	CO2
5.		Draw and explain the R-2R Digital-to-Analogue Converter	5	CO5
6.		Describe Controlled Inverter.	5	CO2

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

			Marks	CO No.
7.	(a)	Convert binary to decimal – $(1001.1011)_2=(?)_{10}$ Convert decimal to octal- $(17.11)_{10}=(?)_8$ Convert hexadecimal to decimal $(71.21)_{16}=(?)_{10}$	6	CO1
	(b)	Simplify the expression using Boolean algebra $\bar{A}B+AB+\bar{A}\bar{B}$	4	CO1
	(c)	If $A\bar{B}+\bar{A}B=C$, show that $A\bar{C}+\bar{A}C=B$	5	CO1
8.	(a)	Explain De-Morgan's laws for simplification of Boolean expression	2	CO1
	(b)	Simplify the following expression using K Map for the 4 variables A, B, C, and D. Y=m1+m3+m5+m7+m8+m9+m12+m13	4	CO1
	(c)	Simplify the Boolean function using K Map $F(A,B,C,D)=\sum m(1,3,7,11,15)+\sum d(0,2,5)$	5	CO1
	(d)	Design a 8 X 1 Multiplexer using two 4 X 1 Multiplexer	4	CO2
9.	(a)	What is a decoder circuit? Design a Full Adder circuit using a 3 to 8 Decoder	6	CO2
	(b)	Why Multiplexers are also known as Data Selectors? Implement the following Boolean function $F(A,B,C,D)=\sum(0,1,3,4,8,9,15)$ using a 8 : 1 Multiplexer	6	CO2
	(c)	Draw and explain the State diagram for J-K flip flop	3	CO3
10.	(a)	Mention the types of different shift registers with block diagram.	3	CO3
	(b)	Draw and explain a Serial In- Parallel Out (PISO) left shift register.	5	CO3
	(c)	Why asynchronous Counters are also known as Ripple Counters?	2	CO3
	(d)	Design a 4-bit asynchronous binary up counter.	5	
11.		Write short notes on any three of the following	3x5=15	
	(a)	Parity Generator and Checker	5	CO2
	(b)	Successive approximation	5	CO2
	(c)	Excitation table for J-K flip flop	5	CO3
	(d)	Master Slave flip flop	5	CO4
	(e)	Ring Counter	5	CO3