GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

DIGITAL LOGIC AND ELECTRONICS

ESC302

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)	What input should be given to "S" when SR flip – flop is converted to JK flip – flop? a) K.Q b) K.Q c) J.Q d) J.Q	1	CO3
	(ii)	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	CO1
	(iii)	Which of the following gives the correct number of multiplexers required to build a 32 x 1 multiplexer? a) Two 16 x 1 mux b) Three 8 x 1 mux c) Two 8 x 1 mux d) Three 16 x 1 mux	1	CO2
	(iv)	What kind of operation occurs in a J – K flip flop when both inputs J and K are equal to 1? a) Preset operation b) Reset operation c) Clear operation d) Toggle operation	1	CO3
	(v)	A priority encoder has four inputs I_0, I_1, I_2, and I_3 where I_3 has the highest priority and I_0 has the least priority. If $I_2 = 1$, what will be the output? a) 00 b) 01 c) 10 d) 11	1	CO2
	(vi)	Total number of inputs in a half adder is _____ a) 2 b) 3 c) 4 d) 1	1	CO2

(vii)	How much input and output needed for Demultiplexer? a) Many outputs to one input b) One input many outputs c) One input one output d) None of these	1	CO3
(viii)	If A and B are the inputs of a half adder, the carry is given by _____ a) A AND B b) A OR B c) A XOR B d) A EX-NOR B	1	CO2
(ix)	The group of bits 11001 is serially shifted (right-most bit first) into a 5-bit parallel output shift register with an initial state 01110. After three clock pulses, the register contains _____ a) 01110 b) 00001 c) 00101 d) 00110	1	CO3
(x)	The register is a type of _____ a) Sequential circuit b) Combinational circuit c) CPU d) Latches	1	CO3
(xi)	_____ is a digital circuit that is capable of storing only a single bit. a) Flip-flop b) NOR gate c) XOR gate d) Register	1	CO3
(xii)	The DeMorgan's Law would state that: a) (AB)' = A + B b) (A+B)' = A'*B c) (AB)' = A' + B d) (AB)' = A' + B'	1	CO1

GROUP – B
(Short Answer Type Questions)

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

		Marks	CO No.
2.	Design a 4-bit bidirectional shift register.	5	CO3
3.	Obtain the (i) canonical SOP and (ii) canonical POS for the following: F (A,B,C) = A + B'C	5	CO1
4.	Design the circuit of 16: 1 MUX by using 8: 1 MUX only.	5	CO3
5.	What is K-map? Solve the expression using K-map and find SOP. F(A, B,C,D) =∑(7,13,14,15)	5	CO1

6. Obtain the simplified function in sum of products (SOP) expression from the following truth table — 5 — CO1

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following — **3×15=45**

			Marks	CO No.
7.	(a)	Design a 2- bit comparator circuit with suitable truth table and diagram.	5	CO2
	(b)	Explain the logic of a 4-bits carry look-ahead adder with suitable diagram.	5	CO2
	(c)	Design the circuit of 3:8 decoder and verify its truth table.	5	CO2
8.	(a)	Describe JK Flip-Flop with truth table and characteristics table.	5	CO3
	(b)	Construct a D flip-flop using S-R flip-flop. Explain its characteristic table and excitation table.	5	CO3
	(c)	Minimize the following expression using K-map Y (A, B, C, D) = Σm (1, 2, 3, 5, 6, 11, 12) + D (7, 8, 10, 14)	5	CO1
9.	(a)	With a circuit diagram, explain the operation of 4 bits Johnson counter implemented using D flip-flop.	5	CO3
	(b)	Explain 4X2 Encoder with truth table and diagram.	5	CO3
	(c)	Differentiate between Programmable logic Array and Programmable Array logic.	5	CO4
10.	(a)	What do you mean by excitation table?	2	CO3
	(b)	Draw the clocked Master-Slave J-K flip-flop configuration and explain how it removes race-around condition in J-K flip-flops.	7	CO3
	(c)	Design Mod 3 synchronous counter.	6	CO2
11.	(a)	What is the application of shift register?	2	CO3
	(b)	Design the circuit of PISO and explain its operation.	7	CO3
	(c)	Design the circuit of BCD to 7-Segment display.	6	CO2