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14th April, 2023

Supplementary/Improvement Examination- 2023

Paper Name: Digital Electronics**Time: 3 Hours****Paper Code: BTCSE 304 / BTCSE AI 304-****Maximum Marks: 75****Course outcomes (CO)**

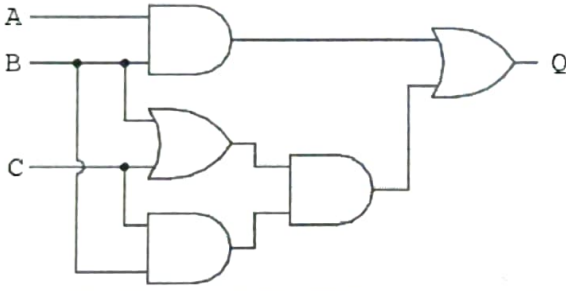
- CO1: Have a thorough understanding of the fundamental concepts and techniques used in digital electronics, and Number conversions, Error correction and detection, Digital logic families.
- CO2: Understand Boolean Algebra and able to minimize Boolean expressions by applying Boolean algebra, K-Map method and Tabulation Method with "don't care" conditions.
- CO3: To analyse and design various combinational logic circuits.
- CO4: Use basic flip-flops SR, JK, D and T; analyse and design synchronous sequential circuits.
- CO5: Have a understanding of the fundamental concepts about various terms and circuits of A/D and D/A converters
- CO6: Analyse Registers and Counters and Memories and design Programmable Logic Devices.

Note: Follow proper numbering for answering the questions.

Section A

All questions are compulsory in this Section.

7 X 5 = 35

Q No.	Questions	Marks	CO	BL
1.	Obtain the simplified expression for 'Q'. 	5	CO1	5
2.	i. Convert the decimal number -25 to binary using two's complement arithmetic. ii. Convert the decimal number 342 to binary, octal, and hexadecimal number systems.	5	CO1	3,5
3.	What is a digital comparator? Discuss 1-bit magnitude comparator?	5	CO3	1,3
4.	Design a full adder circuit using only NAND gates. Show the truth table and the circuit diagram.	5	CO3	5
5.	Minimize the following logic function using K-maps and realize using NAND and NOR gates. $F(A, B, C, D) = \sum (1, 3, 4, 5, 8, 9, 10, 11, 15) + d(2, 13)$	5	CO2	6
6.	Implement the Boolean expression $F(A, B, C) = \sum m(0, 1, 3, 5, 7)$ using an appropriate multiplexer.	5	CO3	6
7.	Explain the working of shift registers and their applications.	5	CO4	4

Section-B

Attempt any **FOUR** Questions from this Section

4 X 10 = 40

Q No.	Questions	Marks	CO	B																																																																																					
8.	Given the following truth table: <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>A</th><th>B</th><th>C</th><th>D</th><th>Output</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table> i. Simplify the Boolean function and write the simplified expression in Sum of Products (SOP) form and Product of Sum (POS) form. ii. Implement the simplified circuit.	A	B	C	D	Output	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	1	1	0	1	0	0	0	0	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	0	0	0	0	1	0	0	1	1	1	0	1	0	1	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	10	CO2	3,6
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9.	Discuss any two of the following: i. 3 Bit Ripple Counter ii. Johnson Counter iii. Architecture and functionality of an ALU. iv. Programmable Logic Devices (PLDs) and their types.	10	CO3, CO4, CO6	1,2																																																																																					
10.	Design a synchronous counter using D flip-flops that counts in the sequence 0-1-2-3-4-5-6-7 and then repeats. Draw the circuit diagram and show the state table.	10	CO6	2,3																																																																																					
11.	Design a MOD-10 synchronous counter using D flip-flops. Draw the logic diagram for the counter and show the state sequence.	10	CO6	2,3																																																																																					
12.	What is a flip-flop? Describe the different types of flip-flops and their characteristics.	10	CO4	1,2																																																																																					
13.	What is analog to digital conversion? Describe the different types of A/D converters and their characteristics.	10	CO5	3,4																																																																																					

BL-Bloom's Taxonomy Levels(1-Remembering,2-Understanding,3-Applying,4-Analysing,5-Evaluating,6-Creating)