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BCA
(SEM II) THEORY EXAMINATION 2024-25
DIGITAL ELECTRONICS

TIME: 3 HRS**M. MARKS: 70****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define digital system. What is the key difference between a digital and an analog system?	1	K2
b.	What are canonical forms? Differentiate between SOP and POS form.	2	K2
c.	Explain don't care condition.	3	K2
d.	Use a 2-variable K-map to simplify the Boolean function $F(A, B) = \sum m(0, 4)$	3	K3
e.	Differentiate between multiplexer and demultiplexer.	4	K2
f.	What is a combinational circuit? How is it different from a sequential circuit?	4	K2
g.	What are a counters?	5	K3

SECTION B**2. Attempt any three of the following:****07 x 3 = 21**

a.	Explain the process of converting a number from: <ul style="list-style-type: none"> (a) Hexadecimal to Decimal (b) Octal to Decimal Use examples and show positional value calculations for clarity.	1	K2
b.	State and prove the following basic theorems of Boolean algebra using truth tables: <ul style="list-style-type: none"> Commutative Law Associative Law Distributive Law 	2	K3
c.	Compare the Karnaugh Map method and the Tabulation method for Boolean minimization. List the advantages and limitations of each. In which scenarios is tabulation preferred over K-map	3	K3
d.	What is the decoder? Draw the logic diagram of 2 to 4 binary decoder.	4	K2
e.	Explain how the JK flip Flop can be converted into D flip flop.	5	K2

SECTION C**3. Attempt any one part of the following:****07 x 1 = 07**

a.	Define the following number systems with suitable examples: <ul style="list-style-type: none"> Binary Octal Decimal Hexadecimal Explain why binary is preferred in digital computers.	1	K3
b.	Explain 1's complement and 2's complement of binary numbers. Perform subtraction using 2's complement method: <p>(i) $26 - 19$</p> <p>(ii) $17 - 34$</p> Show all steps, including binary conversion, complement, and addition.	1	K2



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4. Attempt any *one* part of the following:

07 x 1 = 07

a.	For the Boolean function: $F(A, B, C) = \sum m(0, 1, 2, 5, 6, 7)$ (a) Write its canonical SOP form (b) Simplify it using a Karnaugh Map (K-map).	2	K2
b.	Explain how other logic operations like NAND, NOR, XOR, and XNOR are derived from basic gates. Prove with truth tables that: • NAND and NOR are universal gates	2	K2

5. Attempt any *one* part of the following:

07 x 1 = 07

a.	Explain the tabulation method for minimizing Boolean functions. Demonstrate each step using the function: $F(A, B, C, D) = \sum m(0, 1, 2, 5, 6, 7, 8, 9, 10, 14)$	3	K3
b.	Simplify $F(A, B, C, D) = \sum m(0, 1, 2, 4, 5, 8, 10)$	3	K3

6. Attempt any *one* part of the following:

07 x 1 = 07

a.	Define half adder and full adder.	4	K2
b.	What is multiplexer? Draw the 8 to 1 multiplexer and explain.	4	K3

7. Attempt any *one* part of the following:

07 x 1 = 07

a.	Explain the operation of universal shift register.	5	
b.	Define synchronous counter? Explain 4-bit synchronous counter.	5	