

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fourth Semester

MECHATRONICS ENGINEERING

U18MCT4103: Digital Electronics and Microprocessor

COURSE OUTCOMES

- CO1: Use number systems, Boolean algebra and explain various digital logic families.
- CO2: Apply basic logic gates to design simple circuits and simplify logic circuits using K- Map.
- CO3: Design various combinational and sequential circuits.
- CO4: Explain the architecture of 8085 microprocessor.
- CO5: Develop assembly language program for 8085 for the given application.

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)**

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|---|-----------------------|
| 1. Convert the decimal number 108 into a binary number. | CO1 [K ₃] |
| 2. State DeMorgan's Theorem. | CO1 [K ₁] |
| 3. Draw the truth table of the below shown Half adder. | CO2 [K ₃] |
| 4. What is Parity Generator? | CO2 [K ₁] |
| 5. What is the role of a multiplexer? | CO3 [K ₂] |
| 6. Differentiate Latches and Flip-flops | CO3 [K ₂] |
| 7. What are the basic units of a microprocessor? | CO4 [K ₁] |
| 8. Define opcode and operand. | CO4 [K ₁] |
| 9. What is address decoding? | CO5 [K ₁] |
| 10. What is the function of the 8251A peripheral IC? | CO5 [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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|-----|----|---|----|-----|-------------------|
| 11. | a) | Draw the logic circuit for the following Boolean function
$F = (A+B) (A'+C) (B+D)$ | 8 | CO1 | [K ₃] |
| | b) | Simplify the function using the Karnaugh map.
(i) $F(ABCD) = \Sigma (0, 1, 2, 4, 5, 7, 11, 15)$
(ii) $F(WXYZ) = \Sigma (2, 3, 10, 11, 12, 13, 14, 15)$ | 8 | CO1 | [K ₃] |
| 12. | a) | Implement a full adder with two half-adders and an OR gate. | 8 | CO2 | [K ₃] |
| | b) | Design a truth table for a circuit that functions as a 3-bit odd parity checker. | 8 | CO2 | [K ₅] |
| 13. | a) | Explain the logic behind how the 3 to 8 decoder activates only one output line (Y ₀ to Y ₇) for a specific combination of binary inputs (A, B, and C). | 8 | CO3 | [K ₄] |
| | b) | Design a logic circuit (AND, OR, NOT) with inputs for a 3-bit message (D ₁ , D ₂ , D ₃) and a parity bit (P) to output an error signal (E) if there's an even number of 1s (indicating an error) in the received data using odd parity. | 8 | CO3 | [K ₅] |
| 14. | a) | In a clocked SR Flip-Flop using NOR gates, explain why the "forbidden state" (S=1, R=1) should be avoided and how the clock signal affects the influence of S and R on the output (Q)? | 8 | CO3 | [K ₄] |
| | b) | Illustrate the function of the Asynchronous counter with a timing diagram and truth table. | 8 | CO3 | [K ₂] |
| 15. | | Explain the architecture and pin diagram of the 8085 microprocessors in detail. | 16 | CO4 | [K ₂] |
| 16. | | Discuss the architecture and basic functionality of the 8255 peripheral IC. Provide an example of a simple application where the 8255 could be used. | 16 | CO5 | [K ₃] |
