

Term End External Examination 1st Semester (Session-Feb 2025)

Subject: Computer Applications (Batch 2023 and 2024)

Course No and Title: CAP122M/ Digital Electronics

Time: 2.15 hours

Max Marks:100

Min. Marks:40

Section A: Objective Type Questions

Q1. Choose the appropriate Answer: (8x1.5=12)

- i. Which of the following Boolean identities is correctly stated?
 A $A + AB = A$ B $A + A' = A$
 C $A \cdot 0 = A$ D $A + 0 = 0$
- ii. Which logic gate is known as a universal gate?
 A AND B OR
 C NAND D XOR
- iii. In a multiplexer circuit, the number of selection lines required for 8 inputs is
 A 2 B 3
 C 4 D 8
- iv. A decoder is best defined as:
 A A circuit converting n input lines to a maximum of 2^n unique outputs.
 B A sequential circuit with memory elements
 C A device for storing data. D A universal logic gate.
- v. Which flip-flop typically includes an asynchronous reset input?
 A D Flip-Flop B T Flip-Flop
 C SR Flip-Flop D JK Flip-Flop
- vi. A main advantage of synchronous counters over asynchronous counters is:
 A Simultaneous switching B Lower power consumption
 C Simpler design D Fewer logic gates
- vii. In digital circuits, "PROPAGATION DELAY" refers to:
 A The time taken for a signal to pass through a gate
 B The duration of a clock cycle
 C The hold time of a flip-flop
 D The setup time requirement

flop

- viii. Which device is typically used to implement complex combinational and sequential logic designs?
 A ROM B FPGA
 C EPROM D SRAM

Section-B: Descriptive Type Questions (Short Type)

Q2: Answer all the Questions (8 x 4 =32)

- i. Define Boolean algebra and explain its role in digital electronics.
- ii. Briefly explain De Morgan's theorem with a simple example.
- iii. Simplify the following Boolean function for Sum of Products
 $F(A, B, C, D) = \sum(2, 4, 7, 10, 12, 14)$
- iv. Explain the difference between standard and canonical form SOP with an example.
- v. What is the main difference between synchronous and asynchronous counters?
- vi. Explain the basic operation of a D flip-flop.
- vii. What are programmable logic devices, and why are they useful.
- viii. What is meant by propagation delay and its effect on circuit performance.

Section – C: Descriptive Type Questions (Medium Type)

Answer all the questions: (4 x 7=28)

- Q3. Simplify the Boolean expression: $F = A'B + AB' + AB$ using Boolean algebra.

OR

 Create the truth table for a two-input XOR gate and explain its Boolean representation.
- Q4. Design a 4:1 multiplexer using basic logic gates and describe how the selection works.

OR

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Draw and explain the block diagram of a BCD-to-decimal decoder.

- Q5.** Simplify the Boolean function using Karnaugh Map for SOP

$$F(A, B, C, D) = \sum (0, 6, 8, 13, 14) d(2, 4, 10)$$

OR

Write short notes on NAND and NOR gates. Draw symbol and truth table for NAND and NOR gates. Why are these gates known as universal gates?

- Q6.** Discuss how propagation delay affects the performance of high-speed digital circuits with examples.

OR

Explain the difference between Random-Access Memory (RAM) and Read Only Memory (ROM).

Section – D: Descriptive Type Questions (Long Type)

Answer any two of the following: (2 x 14=28)

- Q7.** Explain what Boolean algebra is and how it is used in digital electronics. Describe some basic laws and give examples of how they help in designing circuits.
- Q8.** Describe how a full adder works. Include a simple diagram, the basic Boolean expression, and explain how the circuit adds two binary numbers.
- Q9.** Explain the basic working of sequential circuits with a focus on flip-flops. Compare the D flip-flop with the JK flip-flop using simple terms and examples.
- Q10.** Describe what an FPGA is and how it is used in digital design. Explain its advantages and give a comparison with traditional logic circuits.