DIGITAL LOGIC DESIGN AND MICROPROCCER

IMP

Unit 1: Introduction

Syllabus Focus: Digital signals, digital circuits (AND, OR, NOT, NAND, NOR, XOR), Boolean algebra, number systems (binary, signed binary, octal, hexadecimal), binary arithmetic, one's and two's complements, codes, error detecting and correcting codes.

Key Topics & Exam Strategy:

1. **Digital Signals:**
    - **High Priority:** What is a signal? Differentiate between **Analog vs. Digital signals**. Be able to list and explain **Characteristics of Digital Signals**.
    - *Exam Tip:* Expect direct definition and characteristic questions.
2. **Logic Gates:**
    - **High Priority: Explain the working of Digital Gates with their types (AND, OR, NOT, XOR, XNOR).**
    - **Very High Priority:** Understand **Universal Gates (NAND and NOR)**. Be able to **justify why they are universal gates using examples** (i.e., how to implement other basic gates using only NAND or only NOR).
    - *Exam Tip:* Questions often involve definitions, truth tables, and implementation using universal gates.
3. **Boolean Algebra:**
    - **Very High Priority: State and prove any two theorems of Boolean algebra.** This is a highly repeated theoretical question. Be familiar with De Morgan's theorems, absorption law, etc.
    - *Exam Tip:* Practice proving theorems.
4. **Number Systems & Codes:**
    - **Moderate Priority:** Understand binary, octal, hexadecimal, and their conversions.
    - **Lesser Priority but Cover:** Basics of **Error Detecting and Correcting Codes**.
    - *Exam Tip:* Conversion problems or short notes on codes.

Unit 2: Combinational Digital Circuits

Syllabus Focus: Standard representation for logic functions, K-map, simplification, minimization, Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, parity checker/generator.

Key Topics & Exam Strategy:

1. **K-Maps & Logic Function Minimization:**

- **Very High Priority: Minimize four-variable logic functions using K-map.** This is a crucial problem-solving skill.
- **Moderate Priority:** Understand **Don't care conditions** and how to use them in K-maps for further simplification.
- *Exam Tip:* Expect a practical problem to minimize a given Boolean expression or minterm/maxterm sum using K-map. **Always draw clear K-map diagrams.**

2. **Multiplexer and De-Multiplexer:**
   - **High Priority: Explain the working of Multiplexer and De-Multiplexer.** Be able to draw their block diagrams and explain their functionality.
   - *Exam Tip:* Direct explanation questions, possibly with simple circuit diagrams.
3. **Adders:**
   - **High Priority: Design a half-adder and full-adder circuits.** Be able to draw their circuit diagrams, derive equations for sum and carry, and explain their implementation.
   - *Exam Tip:* Design-based questions or explanations of circuit functionality.
4. **Combinational vs. Sequential Logic Circuits:**
   - **Moderate Priority: Differentiate between combinational and sequential logic circuit.**
   - *Exam Tip:* Short answer or distinction-based questions.

Unit 3: Sequential Circuits and Systems

Syllabus Focus: 1-bit memory, Bistable latch, clocked SR flip flop, J-K-T and D-types flip flops, applications of flip flops, shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counter design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Key Topics & Exam Strategy:

1. **Flip-Flops (SR, JK, D, T):**
   - **High Priority: Explain SR Flip flop in detail.** Understand its working, truth table, and characteristics.
   - **Moderate Priority:** Be aware of other flip-flop types (JK, D, T) and their basic operation.
   - **Lesser Priority but Cover: Convert S-R FLIP-FLOP TO J-K FLIP-FLOP.** This conversion appeared in one paper.
   - *Exam Tip:* Expect explanations of flip-flop types, truth tables, and characteristic equations.
2. **Applications of Flip-Flops:**

- **Very High Priority: Write and explain any two applications of flip-flop.** This is a highly repeated theoretical question. Think about memory elements, counters, registers, etc.
- *Exam Tip:* Direct recall/explanation question.

3. **Counters:**
    - **Very High Priority: Design a 3-bit synchronous up counter using JK flip-flops.** This is a consistently asked design problem. Practice counter design steps.
    - **High Priority: Differentiate between synchronous and asynchronous counter.**
    - *Exam Tip:* Design problems are common for counters. Theoretical questions on types and differences.
4. **Shift Registers:**
    - **High Priority: Draw and explain serial in serial out shift register in detail.** Also be familiar with other types like serial in parallel out, parallel in serial out, and parallel in parallel out.
    - **Moderate Priority:** Applications of shift registers (e.g., serial to parallel/parallel to serial conversion).
    - *Exam Tip:* Expect diagrams and explanations of shift register operation.

Unit 4: Fundamentals of Microprocessors

Syllabus Focus: Fundamentals of Microprocessor, Comparison of 8-bit (8085), 16-bit (8086), and 32-bit (80386) microprocessors, The 8086 Architecture: Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Key Topics & Exam Strategy:

1. **Microprocessor Comparison:**
    - **Very High Priority: Comparison of 8-bit (8085), 16-bit (8086), and 32-bit (80386) microprocessors.** This is a highly repeated comparative question. Focus on key differences like bus width, addressing capabilities, and general features.
    - **High Priority: Differentiate between 8085 & 8086 microprocessors.**
    - *Exam Tip:* Prepare a table for easy comparison based on features.
2. **8086 Architecture:**
    - **Very High Priority: Draw and explain 8086 Internal Block Diagram.** Understand the function of each block (BIU, EU, registers, etc.).
    - **High Priority: Draw the pin diagram of 8086 and explain in brief.**
    - *Exam Tip:* Diagrams are essential here. Be able to label and briefly explain each component.

3. **Memory:**
    - **High Priority: Write short note on Memory.** Focus on basic memory concepts and types relevant to microprocessor systems.
    - *Exam Tip:* Short descriptive questions.
4. **DMA Controller:**
    - **Moderate Priority: Draw & explain architecture of DMA controller.**
    - *Exam Tip:* Diagrams and brief explanations.

Unit 5: 8086 Instruction Set and Programming

Syllabus Focus: Memory Interfacing, I/O Interfacing, Direct Memory Access (DMA), Interrupts in 8086, 8086 Instruction Set and Programming: Addressing modes, Instruction syntax, Data types, Subroutines, Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing, Instruction timings, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction, Assembly language programs, C language programs, Assemblers and compilers, Programming and debugging tools.

Key Topics & Exam Strategy:

1. **Addressing Modes of 8086:**
    - **EXTREMELY HIGH PRIORITY: Explain different type of Addressing modes of 8086 with examples.** This is arguably the most frequently asked question across all papers. Master all the addressing modes listed (Immediate, Register, Direct, Indirect, Relative, Indexed, Bit inherent, Bit direct).
    - *Exam Tip:* Be prepared to define each mode, explain its calculation, and provide a clear example for each.
2. **Instruction Set Classification:**
    - **High Priority: Explain classification of instruction set.** Understand the different categories (data transfer, arithmetic, logical, branch, subroutine, bit manipulation) and give examples for each.
    - *Exam Tip:* List and explain categories with representative instructions.
3. **Assemblers and Compilers:**
    - **High Priority: Write short note on assembler and compiler.** Understand their roles in software development for microprocessors.
    - **Moderate Priority: Explain assembly language programming tools.**
    - *Exam Tip:* Expect short notes or comparative questions.
4. **Data Transfer Instructions:**
    - **Moderate Priority: Write different Data transfer instructions.** Be able to list and briefly describe common data transfer instructions (e.g., MOV, PUSH, POP).

- *Exam Tip:* List and explain.

General Exam Preparation & Writing Tips:

- **Understand Concepts:** Don't just memorize. Understand *why* things work the way they do.
- **Practice Problem Solving:** For K-maps, counter designs, and addressing mode examples, hands-on practice is key.
- **Draw Diagrams:** For architecture, circuits, pin diagrams, and shift registers, neat and well-labeled diagrams are crucial. They convey understanding and fetch marks.
- **Define Terms Clearly:** When asked to explain, start with a clear definition.
- **Use Examples:** Wherever possible, use relevant examples to illustrate your explanations (e.g., for addressing modes).
- **Time Management:** All questions are compulsory, so allocate your time wisely during the exam.
- **Review all topics:** While this guide prioritizes, ensure you have a basic understanding of all syllabus topics. Sometimes a "lesser priority" topic might appear.

Good luck with your studies!