

## Midterm

### Basic Logic Gates.

- Symbol, Logic, Truth-table, Output expressions for NOT, AND, OR, NAND, NOR, XOR and XNOR gates (for both 2-input and 3-input gates).

### Boolean Algebra and it's use in simplification of Boolean expressions.

- 12 rules of Boolean algebra,
- De-Morgan's Theorem &
- Boolean expressions and simplification.

### Forms of Boolean Expressions.

- Definition of Sum of Products (SOP), Product of sum (POS)
- Classification of Standard and Non-Standard forms of SOP and POS,
- Converting Non-standard SOP to Standard SOP and Non-standard POS to standard POS.

### Deriving truth table and Boolean expressions from each other.

- Active high and low Input/Output systems and their relation with SOP and POS expressions.
- Developing truth-table from non-standard SOP or POS expressions.
- Developing standard SOP and POS expressions from given truth-table.

### Boolean Expression implementation using Basic Logic Gates.

### Universal Gates and Boolean expression implementation using Universal Gates.

- Definition of Universal Gates
- Boolean expression implementation using Universal Gates

### Karnaugh Map and it's use in simplification of Boolean expressions.

- Drawing 2, 3, 4 variable k-map.
- Filling up 2, 3, 4 variable k-map.
- Grouping of inputs for 2, 3, 4 variable k-map.
- Retrieval of simplified output expression for 2, 3, 4 variable k-map.

### Design of complex digital system (Half-Adder, Full-Adder, Half Subtractor, Full Subtractor, n-bit Magnitude Comparator, Complex Engineering Problems).

- Block Diagram
- Operation/ Behavior Tracing
- Development of Truth-table for all possible combination of input/output relationship
- Obtaining simplified output expression using rules of Boolean Algebra and De-Morgan's/ k-map.
- Drawing logic gate diagram using basic logic gate and universal logic gates.

### Number System

- Conversion to and from
  - Decimal to Binary, Octal, Hexadecimal systems (both integer and float)
  - Binary to Gray, Excess 3
  - 8-bit signed number system
  - Decimal to BCD (including invalid conditions)
    - Sign-magnitude
    - 1's Complement
    - 2's Complement
- Binary Arithmetic Operation
  - Addition
  - Subtraction
  - Arithmetic Operation of BCD numbers

## Final Term

### Design of complex digital system (continued) (Encoder, Decoder, Multiplexer, Demultiplexer),

- Block Diagram
- Operation/ Behavior Tracing
- Development of Truth-table for all possible combination of input/output relationship
- Obtaining simplified output expression using rules of Boolean Algebra and De-Morgan's/ k-map.
- Drawing logic gate diagram using basic logic gate and universal logic gates.

### Sequential Logic Circuit Design using gates and flip-flop block diagrams

- Logic Gate Diagrams, Truth-Table & Timing Diagrams for
  - Latches (S-R & D) (Active High/Low input)
  - Gated Latches (S-R & D)
  - Flip-flops (S-R, D, J-K, T, Master-Slave)
- Applications of Flip-flops
  - Parallel Data storage using D-flip-flops.
  - Frequency Division using J-K flip-flops.
  - Asynchronous Counters (n-bit and Modulus Counters).
  - Synchronous Counters (n-bit, Modulus, Irregular & up-down Counters).
  - Johnson and Ring Counter